

## Revision of the Genus *Pandanus* Stickman, Part 27 *Pandanus* Novelties from Madagascar

HAROLD ST. JOHN<sup>1</sup>

AT THE BEGINNING of the eighteenth century *Pandanus* was found growing naturally on Madagascar. The first species from there were described by du Petit Thouars. Subsequent discoveries revealed that it was one of the three great centers of the genus, with 63 species.

With support from a grant by the National Science Foundation, the writer spent ten weeks in 1961 exploring the island for *Pandanus*. First a map showing all known localities for the accepted species was prepared. Then, three expeditions were undertaken in search of *Pandanus*, the route in all cases being to regions from which no previous collector had obtained specimens. As the genus is widespread on the island, the result of the search was the discovery of numerous additional species. Several of them are here described as new.

### Section *Acanthostyla*

*Pandanus columnaris* sp. nov. (sect. *Acanthostyla*)

Figs. 247, 253 bottom, left and right.

NOM. VERN.: "fandran."

DIAGNOSIS HOLOTYPE: Arbor *columnaris*, trunco 20 m alto 25 cm diametro, cortice pallide brunneo cum spinis conicis, radicibus fultrosis nullis vel paucis eis 20 cm longis 1.5 cm diametro pallide brunneis et spinosis, corona anguste cylindrica in apice cum foliis magnis in spiris deinde infra trunco cum ramulis lateralibus secundariis brevibus subaequalibus cum foliis minoribus angustis, foliis terminalibus 2 m et plus longis proxima basem 24 cm latis crassiter coriaceis supra midnervum sulcatis 2-plicatis, in sectione mediali cum 98 nervis parallelis secundariis in dimidio quoque proxima basem infra nervis tertiis evidenter et reticulis breviter oblongis formantibus, laminis ligulatis, in basi ex 16–17 cm marginibus cum spinis 3–5 mm longis 4–10 mm separatis basi incrassata sed apice subulato inferioribus recurvatis superioribus adscendentibus, midnervo infra ex 19 cm cum spinis 3 mm longis 4–8 mm separatis late conicis sed apice subulato recurvato, in sectione mediali marginibus cum aculeis 2–3 mm longis 3–10

mm separatis subulatis adscendentibus, midnervo infra cum aculeis 1.5–2.5 mm longis 2–7 mm separatis subulatis adscendentibus, ramulis lateralibus medialis brevibus 2–2.5 mm diametro brunneis in toto spinosis, foliis 1–1.2 m longis 18–22 mm latis graciliter coriaceis supra obscure olivaceis infra pallide viridibus et glaucis subcurvatis non cassatis supra late V-sulcatis 2-plicatis et ad apicem plicis acute serrulatis in sectione mediali cum 21 nervis parallelis secundariis nervis tertialis nullis lamina ligulata in apice trigono subulato diminuenti eo 10 cm ex apice 6–10 mm lato basi inermi amplexicauli alba, marginibus basi ex 15 cm cum aculeis subulatis 0.5–1.2 mm longis 4–10 mm separatis vel cum serrulis albis cum apicibus brunneis, midnervo infra ad medium vel ultra inermi, in sectione mediali marginibus cum serrulis 0.2–0.9 mm longis 2–4 mm separatis albis, midnervo infra inermi vel cum serrulis 0.1–0.2 mm longis 7–12 mm separatis albis, in apice marginibus et midnervo infra cum serrulis 0.3–0.5 mm longis 2–3 mm separatis albis, infrutescentia non visa sed dicit "in ramulis lateralibus et cum spicis luteis," phalangibus 20–22 mm longis 10–15 mm latis 8–11 mm crassis obovoideis compressis 4–7-carpellatis parte  $\frac{1}{3}$  supera libera, stylis 6–7 mm longis acicularibus arcuatis in basi conica brevi affixis, stigmatibus 6–7 mm longis linearibus proximalibus papillois, endocarpio in parte  $\frac{1}{3}$  supera osseoso brunneo lateribus 1–1.5 mm crassis intra laevibus et lucidis, seminibus 3.5–5 mm longis ellipsoideis, mesocarpio apicali 3 mm longo cum fibris validibus longitudinalibus, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Tree, columnar, the trunk 20 m tall, 25 cm in diameter; bark light brown, conic spiny; prop roots none or few and 20 cm long, 2.5 cm in diameter, light brown, spiny; crown narrowly cylindric, the apex with spirals of large leaves, but below them half or more than half of the length of the trunk with short secondary branchlets, all subequal, and bearing numerous small, narrow leaves; terminal leaves in spirals at apex of trunk, more than 2 m long, 24 cm wide near the base, thick coriaceous, furrowed above the midrib and the sides pleated, near the midsection with 98 parallel secondary veins in each half, near the base below the tertiary cross veins visible, forming short oblong meshes; blade

<sup>1</sup> B. P. Bishop Museum, Honolulu, Hawaii 96819. Manuscript received May 16, 1963.

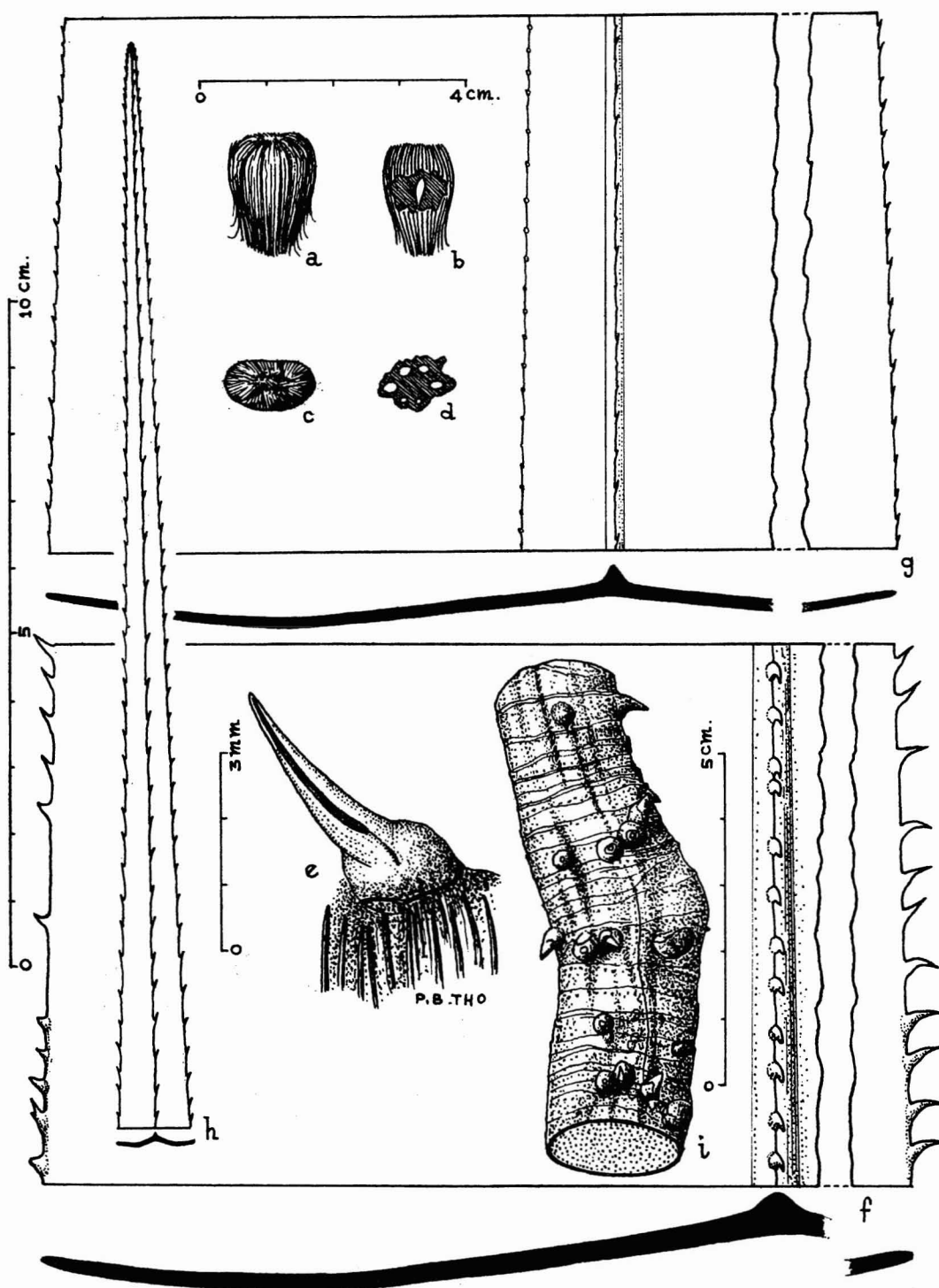


FIG. 247. *Pandanus columnaris* St. John, from holotype. *a*, Phalange, lateral view,  $\times 1$ ; *b*, phalange, longitudinal median section,  $\times 1$ ; *c*, phalange, apical view,  $\times 1$ ; *d*, endocarp and seed cavities, transverse median section,  $\times 1$ ; *e*, style and stigma, lateral view,  $\times 10$ ; *f*, half of leaf base, lower side,  $\times 1$ ; *g*, half of leaf middle, lower side,  $\times 1$ ; *h*, leaf apex, lower side,  $\times 1$ ; *i*, branchlet,  $\times 1$ .

ligulate, at the tip narrowing into a short trigonous subulate apex which 10 cm down is 6–10 mm wide; near the base beginning at 16–17 cm the margins with spines 3–5 mm long, 4–10 mm apart, subulate from a stout base, the lower ones divergent, then the next slightly ascending; the midrib below beginning at 19 cm with spines 3 mm long, 4–8 mm apart, the base broad conic, the apex subulate, recurved; at midsection the margins with prickles 2–3 mm long, 3–10 mm apart, subulate, ascending; the midrib below with prickles 1.5–2.5 mm long, 2–7 mm apart, subulate, appressed ascending; on the subulate apex the margins and midrib below with subulate serrulations 0.2–0.3 mm long, 0.5–3 mm apart, white; lateral branchlets 2–2.5 cm in diameter, brown, sharp conic spiny right up to the leaves; leaves 1–1.2 m long, 18–22 mm wide, thin, coriaceous, above dark olive-green, below pale green and glaucous, gently curved, not breaking across, above with a broad V-shaped furrow occupying the middle half, the lateral quarters pleated but horizontal, near the apex the two pleats sharply serrulate above; at midsection with 21 parallel secondary veins in each half, no tertiary cross veins, blade ligulate, narrowing near the tip to a trigonous subulate apex, this 10 cm down 6–10 mm wide, the base unarmed and amplexicaul, white, the margins near the base beginning at 15 cm with prickles 0.5–1.2 mm long, 4–10 mm apart, from serrulate to subulate, ascending, white, brown-tipped; midrib below unarmed to the middle or beyond; at midsection the margins with serrulations 0.2–0.9 mm long, 2–4 mm apart, white; the midrib below unarmed or with serrulations 0.1–0.2 mm long, 7–12 mm apart, white; on the subulate apex the margins and midrib below with serrulations 0.3–0.5 mm long, 2–3 mm apart, white; pistillate inflorescence not seen, but reported to be "on the small, lateral branchlets, spicate, yellow." Phalanges 20–22 mm long, 10–15 mm wide, 8–11 mm thick, obovoid, compressed, 4–7-celled, upper  $\frac{1}{3}$  of body free; styles 6–7 mm long, acicular, outward arcuate, borne from a short conic base; stigmas 6–7 mm long, linear, proximal, brown, papillose; endocarp in upper  $\frac{1}{3}$  of body, bony, brown, the lateral walls 1–1.5 mm thick, the inner surfaces dark brown, smooth, shining; seeds 3.5–5 mm long, ellip-

soid; apical mesocarp 3 mm long, sparse, with strong longitudinal fibers; basal mesocarp fibrous and fleshy.

HOLOTYPE: Malagasy Republika, Andasibe, ligne Cap Est, 20 km S of Antalaha, in remnant of coastal forest, infrequent, 5 m alt, 6 Sept. 1961, *H. St. John* 26,571 (BISH).

DISCUSSION: *P. columnaris* is a member of the section *Acanthostyla*, as is its closest relative, *P. mangokensis* Martelli, a species with the drupes 12–15 mm long, 7–9 mm wide, the body ovate-obpyramidal and 9–11 mm long; styles 1–3, and 4–5 mm long; endocarp "ad basim drupae sita"; terminal leaves 1.4–1.6 m long, 8 cm wide; leaves of lateral branchlets 80 cm long, and 1–1.4 cm wide. *P. columnaris* has the drupes 20–22 mm long, 10–15 mm wide, the body 14–15 mm long, broad obovoid; styles 6–7 mm long; endocarp in the upper  $\frac{1}{3}$ ; terminal leaves 2 or more meters long, 24 cm wide; leaves of the lateral branchlets 1–1.2 m long, and 1.8–2.2 cm. wide.

The new epithet is the Latin adjective *columnaris*, columnar, and is descriptive of the shape of the crown of the tree.

*Pandanus pluriloculatus* sp. nov. (sect. *Acanthostyla*)

Figs. 248, 249, 250a, b.

NOM. VERN.: "fandran."

DIAGNOSIS HOLOTYPI: Arbor 22 m alta 30 cm diametro, cortice obscure brunneo cum spinis conicis, radicibus fultuosis plerumque nullis, corona anguste cylindrica in apice cum spiris tribus foliarum grandium sed infra cum ramulis multis brevibus aequalibus cum foliis multis angustioribus et fructibus, foliis terminalibus 1.35–1.6 m longis 10–14 cm latis crassis coriaceis V-sulcatis et proxima apicem 2-plicatis in sectione mediali cum 79 nervis parallelis secundariis in dimidio quoque, in foliis vetustis siccis nervis tertiis transversis conspicuis et reticulis oblongis brevibus formantibus, lamina ligulata supra olivacea infra pallide viridibus et glaucis, basi amplexicauli inermi sed ex 10 cm marginibus cum aculeis 1–2.5 mm longis 2–5 mm separatis subulatis rectis vel arcuatis albis, midnervo infra ex 19 cm cum aculeis 1 mm longis 3–10 mm separatis subulatis adpresse reflexis fragilibus, in sectione mediali marginibus cum aculeis 1–2 mm longis 1–2.5 mm separatis crasse subulatis albis valde adscendentibus, midnervo infra cum aculeis 0.5–1 mm longis 2–4 mm separatis subulatis fragilibus albis adpresse adscendentibus, in

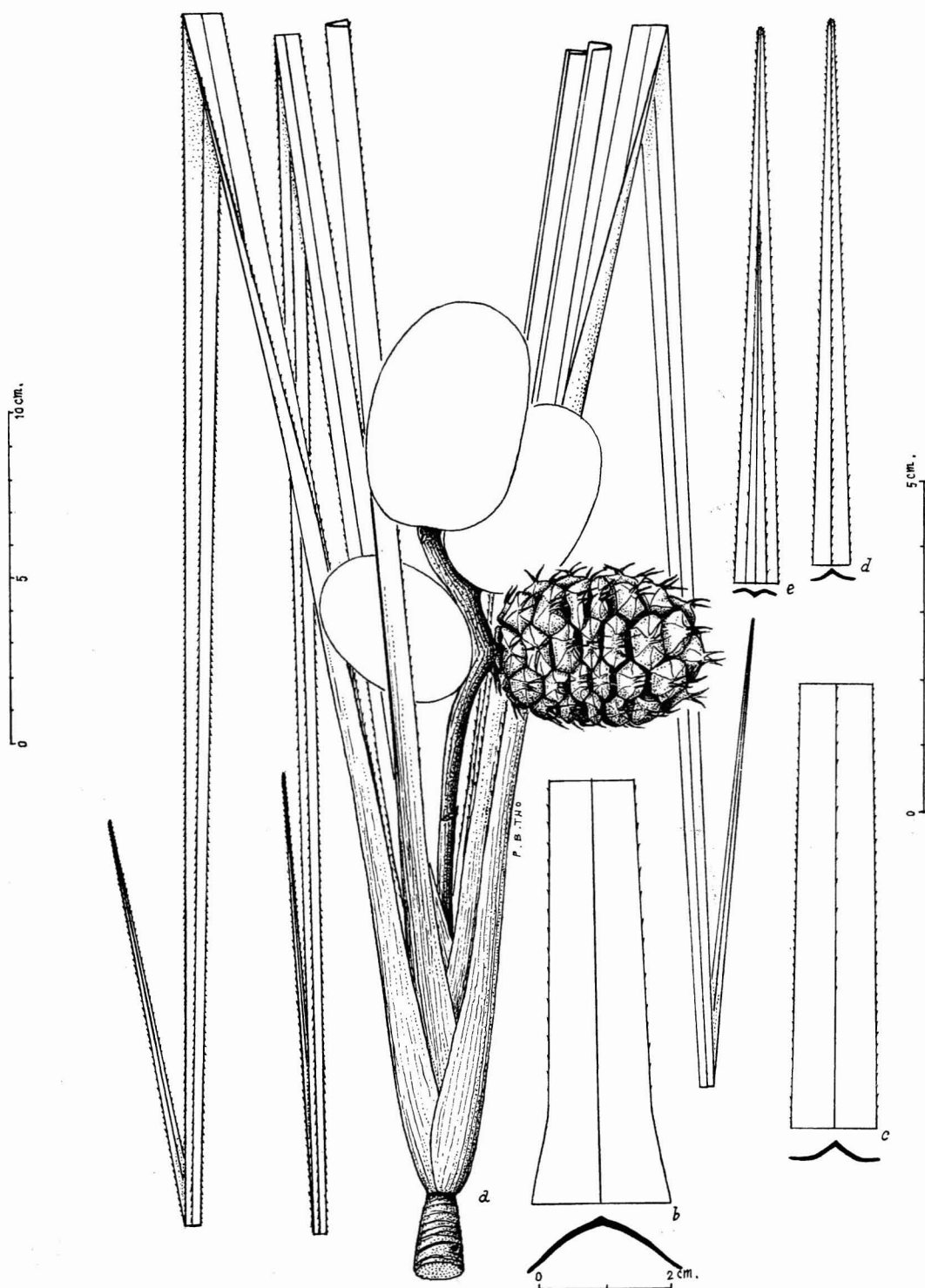
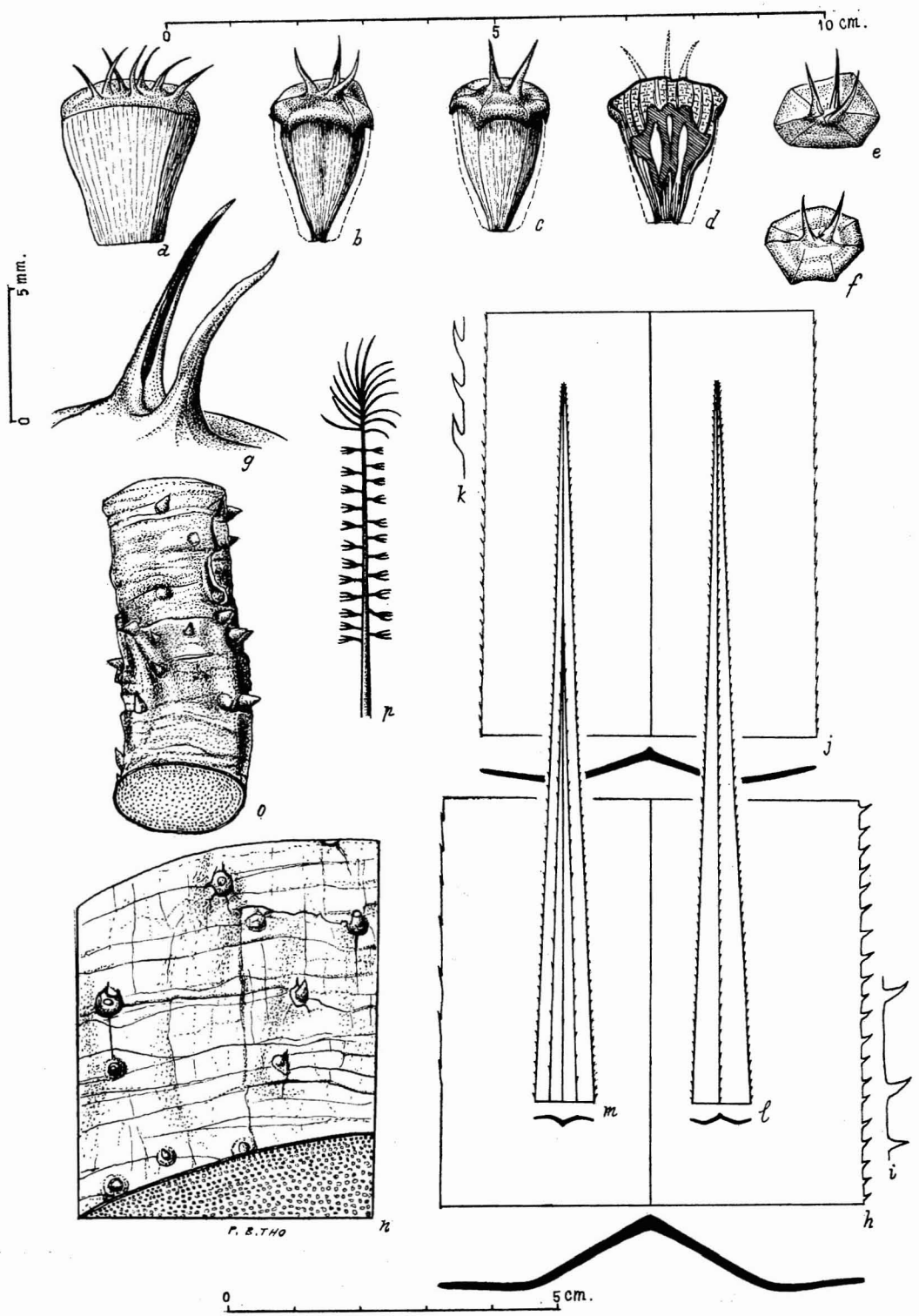


FIG. 248. *Pandanus pluriloculatus* St. John, from holotype. *a*, Fruiting lateral branchlet,  $\times \frac{1}{2}$ ; *b*, leaf base of same, lower side,  $\times 1$ ; *c*, leaf middle of same, lower side,  $\times 1$ ; *d*, leaf apex of same, lower side,  $\times 1$ ; *e*, leaf apex of same, upper side,  $\times 1$ .





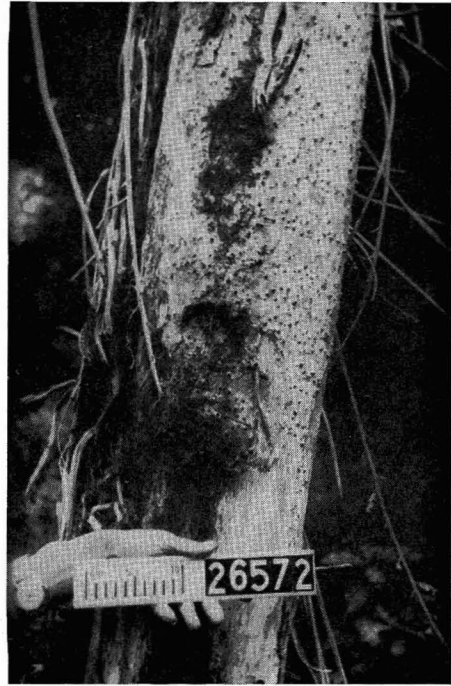
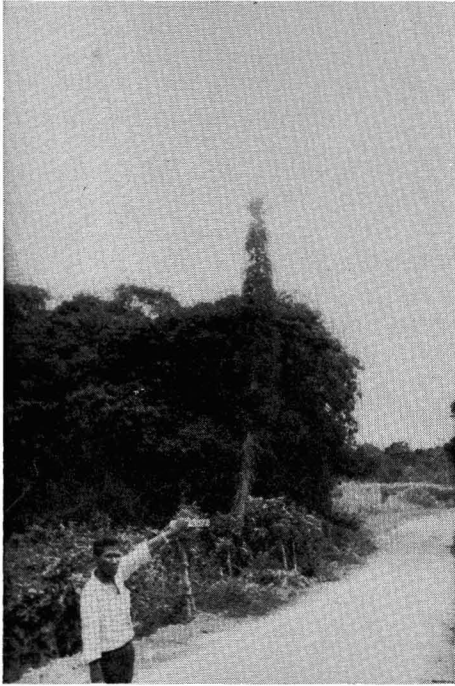


FIG. 250a. *Pandanus pluriloculatus* St. John, holotype. Left, view of the slender, columnar crown of the tree; right, lower part of trunk.

apice marginibus et midnervo infra cum serrulis 0.2–0.3 mm longis 0.5–1.5 mm separatis albis, ramulis lateralibus cum foliis 71–83 cm longis 15–16 mm latis coriaceis supra obscure olivaceis infra viridibus et glaucis supra midnervum profunde V-sulcatis partibus lateralibus quadralibus horizontalibus et cum plicis duobus et eis per sectionem ultimum supra subulato-serratis, in sectione mediali cum 22 nervis parallelis secundariis nervis tertiis nullis lamina ligulata sed in apice subulato contracta eo in puncto 10 cm ex apice 12 mm lato, marginibus ex 8.5 cm cum subulato-serrulis 0.3–0.8 mm longis 2–3 mm separatis albis, midnervo ex basi ad medium inermi, in sectione mediali marginibus et midnervo infra cum aculeis 0.2–0.4 mm longis 1.5–4 mm separatis subulatis, in apice marginibus et midnervo infra cum serrulis 0.2–0.3 mm longis 0.5–1 mm separatis albis, infructescentia in ramulis lateralibus terminalibus, pedunculo 8–14 cm longo 1 cm diametro 3-laterato rhachidi 3–5 cm longo, syncarpis 3–4 congestis 5–9 cm longis 5–6.5 cm diametro plerumque ellipsoideis sed eis minoribus ellipsoideis

vel globosis illis terminalibus maximis et cum 86–92 phalangibus in seriebus plerumque verticalibus, eis minoribus cum 32 vel pluribus phalangibus, phalangibus 27–29 mm longis cum stylis 14–20 mm latis 11–14 mm crassis cuneatis parte  $\frac{1}{6}$  supera libera (5)–6-angulis laevibus lucidis apice depresso conico et marginibus canaliculatis lateribus planis, stylis (2)–3–5–(6) et 7–9 mm longis subulatis vel acicularibus in centro congregatis basi conica viridi 1–2 mm alta, stigmatibus 5–8 mm longis linearibus brunneis papillosis centripetalibus ad apicem non extentis, endocarpio mediali osseoso brunneo 10 mm longo lateribus lateralibus 2 mm crassis intra laevibus et lucidis, seminibus 5 mm longis ellipsoideis, mesocarpio apicali medullosa et cum fibris longitudinalibus, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Tree, 22 m tall, 30 cm in diameter, bark brown, conic spiny; prop roots mostly none; crown narrowly cylindrical, the apex with three spirals of large leaves,

FIG. 249. *Pandanus pluriloculatus* St. John, from holotype. a–c, Phalanges, lateral view,  $\times 1$ ; d, phalange, longitudinal median section,  $\times 1$ ; e–f, phalanges, apical view,  $\times 1$ ; g, styles and stigmas, lateral view,  $\times 4$ ; h, base of leaf of terminal plume, lower side,  $\times 1$ ; i, basal marginal spines of terminal leaf,  $\times 2$ ; j, leaf middle, lower side, of terminal leaf,  $\times 1$ ; k, spines of median leaf margin, of terminal leaf,  $\times 2$ ; l, apex, lower side, of terminal leaf,  $\times 1$ ; m, apex, upper side, of terminal leaf,  $\times 1$ ; n, bark of branch,  $\times 1$ ; o, branchlet,  $\times 1$ ; p, diagrammatic profile of tree, much reduced.



FIG. 250b. *Pandanus pluriloculatus* St. John, holotype. *Top*, middle portion of trunk, with narrow-leaved, lateral, fertile branches; bottom, trunk apex, showing lateral fertile branches and the terminal plume of large leaves.

but below them most of the length of the trunk with many, equal, short branchlets with numerous narrow leaves and spikes of fruit; terminal leaves 1.35–1.6 m long, 10–14 cm wide, thick, coriaceous, with a V-shaped furrow above the midrib and near the tip the sides pleated, at midsection with 79 parallel secondary veins in each half, on old dry leaves the tertiary cross veins well marked and making short oblong meshes, blade ligulate, above olive-green, below pale green and glaucous, near the base beginning at 10 cm the margins with prickles 1–2.5 mm long, 2–5 mm apart, subulate, straight or arcuate, white; the midrib below beginning at

19 cm with prickles 1 mm long, 3–10 mm apart, subulate, reflexed, appressed, weak; at midsection the margins with prickles 1–2 mm long, 1–2.5 mm apart, thick subulate, closely ascending, white; the nearby midrib below with prickles 0.5–1 mm long, 2–4 mm apart, subulate, appressed ascending, white, weak; on the subulate apex the margins and midrib below with serrulations 0.2–0.3 mm long, 0.5–1.5 mm apart, white; the narrow leaves of the lateral branchlets 71–83 cm long, 15–16 mm wide, coriaceous, above dark olive-green, below pale green and glaucous, the center half a deep V-shaped furrow above the midrib, the lateral

quarters horizontal and with two pleats that for the last few centimeters are subulate-serrate above, at midsection with 22 parallel secondary veins in each half, no tertiary cross veins, blade ligulate but contracted into a trigonous subulate apex which 10 cm down is 12 mm wide; near the base beginning at 8.5 cm the margins with subulate-serrulations 0.3–0.8 mm long, 2–3 mm apart, white; the midrib below unarmed to near the middle; at midsection the margins and midrib below with prickles 0.2–0.4 mm long, 1.5–4 mm apart, subulate; on the subulate apex the margins and midrib below with serrulations 0.2–0.3 mm long, 0.5–1 mm apart, white; the apex short subulate, and at the point 10 cm down 12 mm wide; the leaves of juvenile plants 3.63 m long, 18 cm wide; infructescence terminal on lateral branchlets; peduncle 8–14 cm long, 1 cm in diameter, 3-sided; rhachis 3–5 cm long; syncarps 3–4, crowded, 5–9 cm long, 5–6.5 cm in diameter, mostly ellipsoid, but the smaller lower ones ellipsoid to globose, the terminal one the largest, and this one bearing 86–92 phalanges in mostly vertical rows, the smaller lower syncarps with as few as 32 phalanges; phalanges 27–29 mm long (including the style), 14–20 mm wide, 11–14 mm thick, wedge-shaped, upper  $\frac{1}{4}$  of body free ( $\frac{1}{9}$  free including style), on the free apex the center depressed conic, its sides arising from a shallow depression or canal within the obtuse rim, (5)–6-angled, the surface smooth, shiny, the sides flat; the (2)–3–5–(6) styles 7–9 mm long, subulate or acicular, irregularly grouped near the center; green conic style base 1–2 mm high; stigma 5–8 mm long, linear, brown, papillose, centripetal, not running to the apex; endocarp median in the body, bony, brown, 10 mm long, the lateral walls 2 mm thick, the inner surfaces smooth, shining; seeds 5 mm long, ellipsoid; apical mesocarp of pith and longitudinal fibers; basal mesocarp fibrous and fleshy.

**HOLOTYPE:** Malagasy Republika, Andrapengy, 22 km N of Antalaha, cut-over swampy forest, 8 m alt, Sept. 7, 1961, *H. St. John* 26,572 (BISH).

**SPECIMENS EXAMINED:** Malagasy Republika, Andrapengy, same data as above, juvenile, *H. St. John* 26,573 (BISH).

**DISCUSSION:** *P. pluriloculatus* is a member of the section *Acanthostyla*, as is its closest relative, *P. pseudobathiei* Pic. Ser., which has the pistillate spadix 25–35 cm long, 5–7 mm in diameter; syncarps 2–3, subglobose, 4–6.5 cm long, 3.5–5.5 cm in diameter; phalanges 1–(2–4)-celled, 26 mm long, 11–17 mm wide; endocarp in upper  $\frac{1}{3}$  and 14 mm long; and the leaves of the lateral branchlets 1 m or more in length. *P. pluriloculatus* has the peduncle 8–14 cm long, 1 cm in diameter; syncarps 3–4, mostly ellipsoid, but some lower ones globose, 5–9 cm long, 5–6.5 cm in diameter; phalanges (2)–3–5–(6)-celled, 27–29 mm long, 14–20 mm wide; endocarp median, 10 mm long; and the leaves of the lateral branchlets 71–83 cm long.

The new epithet is formed from the Latin *plus*, many; *loculatus*, with locules or carpels, and is given with reference to the more numerous locules of the compound ovary.

#### Section *Dauphinensia*

*Pandanus centrifugalis* sp. nov. (sect. *Dauphinensia*)

Figs. 251, 252, 253 top, left and right  
NOM. VERN.: "hofa."

**DIAGNOSIS HOLOTYPE:** Arbor 10 m alta 20 cm diametro, corona lata, cortice brunneo cum spinis conicis multis, ramulis 8.5 cm diametro, cicatricibus foliarum 6 mm altis, radicibus fulturosis nullis vel paucis et 1 m longis 2.5 cm diametro pallide brunneis cum spinis parvis remotis conicis brevibus, foliis 1.58–1.65 m longis 9–11.6 cm latis crassiter coriaceis sensim curvatis sed non fractis exlucidis supra olivaceis infra viridibus supra midnervum sulcatis anguste V-formatis sine plicis in sectione mediali cum 58 nervis parallelis secundariis in dimidio quoque nervis tertiis evidentis solum in basi laminis ligulato-gladiformatis in apice trigono crassiter subulato diminuentibus eo 10 cm ex apice 6–14 mm lato basi amplexicauli inermi alba et cum extensionibus lateralibus 15–20 cm longis 1–1.5 cm latis integris membranaceis, marginibus ex 15–20 cm cum spinis 4–10 mm separatis deltoideis ascendentibus albis opaquis cum apicibus subulatis brunneis spinis biformatis majoribus 6–8 mm longis minoribus 3–5 mm longis, midnervo infra ex 25 cm cum spinis 3–4 mm longis 3–12 mm separatis inferioribus reflexis basibus latiter conicis apicibus subulatis alteris ascendentibus, in sectione mediali marginibus cum spinis 3–5 mm longis 4–12 mm separatis irregularibus biformatis majoribus vel minoribus latiter subulatis ascendentibus, midnervo infra cum aculeis 2.5–3 mm longis 6–15 mm separatis irregularibus arcuato-

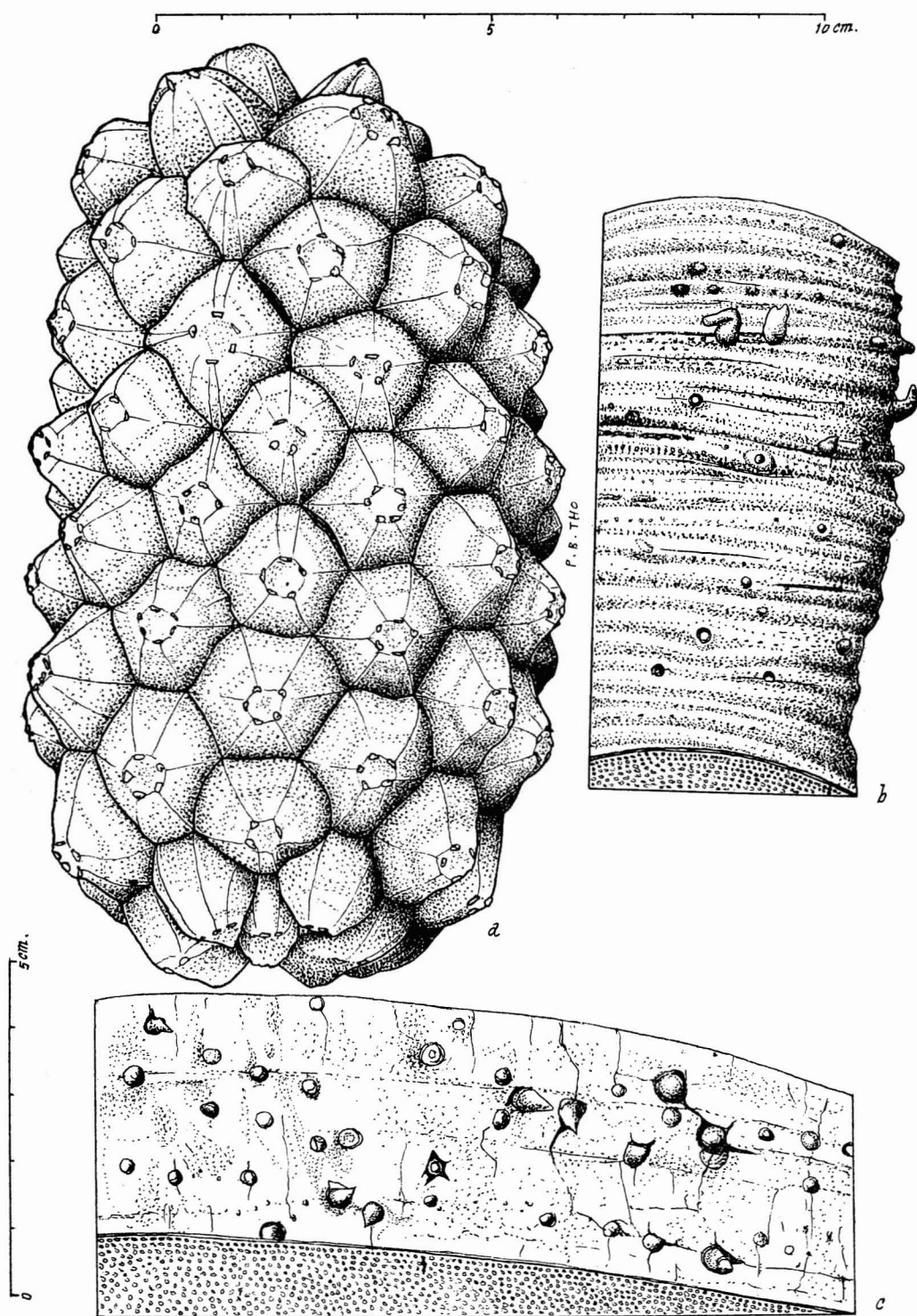


FIG. 251. *Pandanus centrifugalis* St. John, from holotype. *a*, Syncarp, lateral view,  $\times 1$ ; *b*, bark of branchlet,  $\times 1$ ; *c*, bark of trunk,  $\times 1$ .

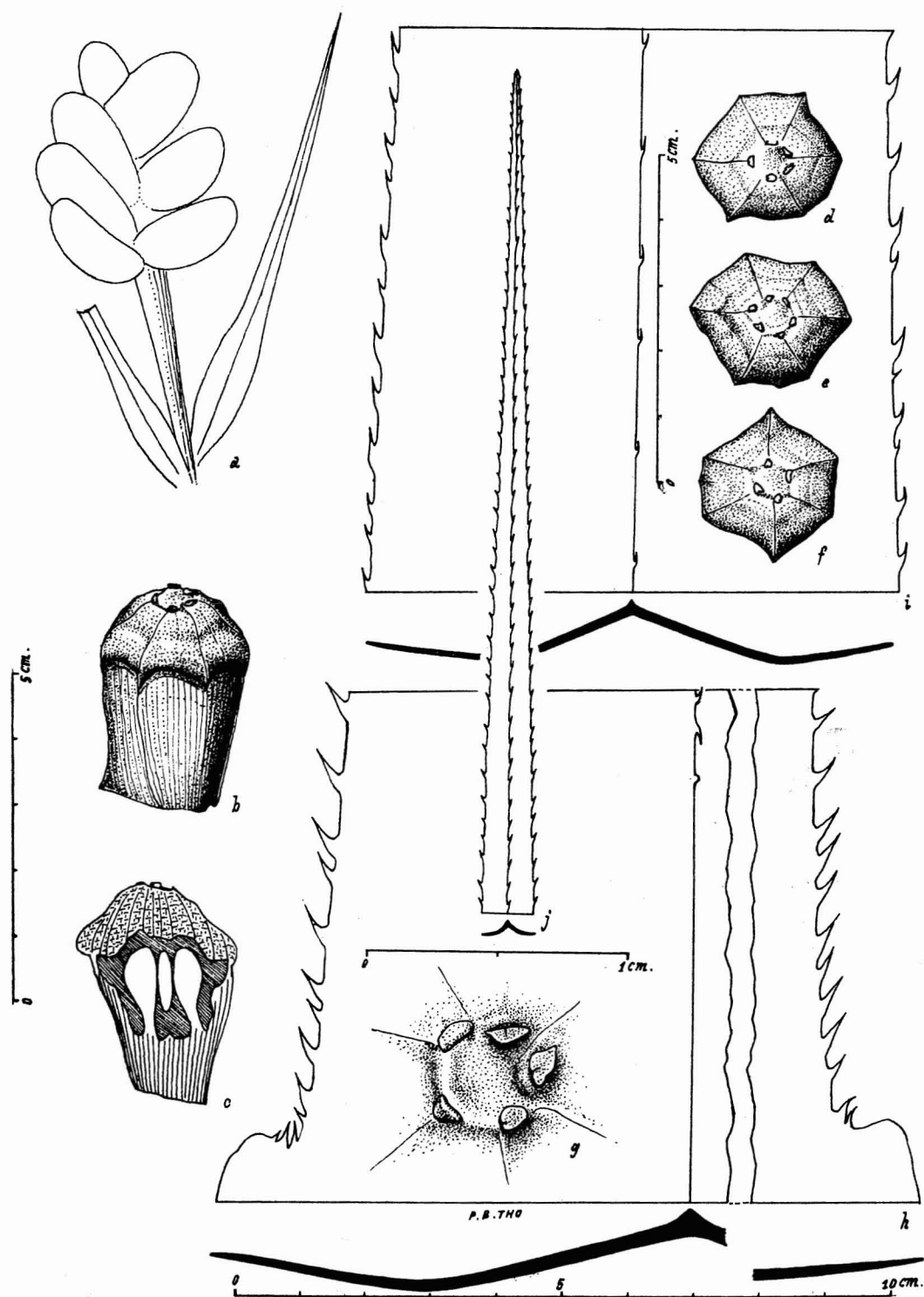


FIG. 252. *Pandanus centrifugalis* St. John, from holotype. *a*, Sketch of infructescence,  $\times \frac{1}{8}$ ; *b*, phalange, lateral view,  $\times 1$ ; *c*, phalange, longitudinal median section,  $\times 1$ ; *d-f*, phalanges, apical view,  $\times 1$ ; *g*, stigmas, apical view,  $\times 4$ ; *h*, half of leaf base, lower side,  $\times 1$ ; *i*, leaf middle, lower side,  $\times 1$ ; *j*, leaf apex, lower side,  $\times 1$ .





FIG. 253. Top left, trunk of *Pandanus centrifugalis* St. John, holotype; top right, fruiting branch; bottom left, trunk and prop roots of *Pandanus columnaris* St. John, holotype; bottom right, trunk of same.



subulatis compressis, in apice marginibus cum dentibus 0.7–2.5 mm longis 1–4 mm separatis irregularibus biformatis majoribus latiter arcuato-subulatis adscendentibus albis cum apicibus minime brunneis olim bidentatis, midnervo infra cum subulato-serrulis 0.5–1 mm longis, inflorescentia foeminea terminali erecta spicata cum 9 syncarpiis in 3 seriebus, pedunculo 30 cm longo in apice 5 cm diametro clavato 3-laterato cum 2 bracteis basilaribus foliaceis 80 cm longis 10 cm latis et cum bracteis binis caulinaribus caducis, rhachide 18 cm longo, syncarpiis congregatis 12–15.5 cm longis 8.5–9 cm latis 6–7.5 cm crassis ovoideo-cylindricis sed latere proximo plano cum 65–71 phalangibus in seriebus verticalibus, axili carnosus et fibroso, phalangibus 3–3.5 cm longis 2–3.1 cm latis 1.7–2.6 cm crassis aurantiaco-luteis obovodeis sed basi longiter cuneato-obpyramidaliter truncato parte  $\frac{1}{3}$  supera libera pyramidaliter-hemispherico (5)–6-anguloso apice truncato vel vadoso concavo 7–10 mm lato orbiculari vel elliptico et cum (3–4)–5–7–(8) stigmatibus in margine circuli (rare cum stigmate unico centrali), stigmatibus 1.5–2 mm longis brunneis papillosis horizontalibus superficialibus cordatis vel reniformibus vel cordato-ovatis plerumque centrifugalibus sed paucis tangentialibus enim paucis centripetalibus, sinibus 1 mm longis profundis, endocarpio mediali osseoso brunneo lateribus lateralibus 3–4 mm crassis intra laevibus et lucidis, seminibus 6–8 mm longis late ellipsoideis, mesocarpio apicali medullosos et cum fibris longitudinalibus, mesocarpio basali fibroso et carnosus.

**DIAGNOSIS OF HOLOTYPE:** Trees to 10 m tall, 20 cm in diameter; crown wide; bark brown, with numerous, sharp conic spines; branchlets 8.5 cm in diameter; leaf scars 6 mm high; prop roots none or less commonly present and up to 1 m long and 2.5 cm in diameter, light brown, with small, remote, short conic spines; leaves 1.58–1.65 m long, 9–11.6 cm wide, thick coriaceous, gently down-curved but not breaking across, dull, above olive-green, below green, narrowly furrowed above the midrib, in section V-shaped but somewhat curving towards the margin, not pleated, at midsection with 58 parallel secondary veins in each half, no visible tertiary cross veins except at the very base, blade ligulate-sword-shaped, narrowing to a stout, trigonous, subulate apex, this at 10 cm down 6–14 mm wide, the base amplexicaul, unarmed, white, and with membranous, entire, lateral flanges 1–1.5 cm wide and 16–20 cm long, at base beginning at 15–20 cm the spines 4–10 mm apart, ascending, deltoid with subulate brown tips, otherwise opaque white, of two sizes, the major ones 6–8 mm long, the smaller

ones 3–5 mm long; the midrib below beginning at 25 cm with spines 3–4 mm long, 3–12 mm apart, the first several reflexed subulate from broad conic bases, the later ones ascending; at midsection the margins with spines 3–5 mm long, 4–12 mm apart, irregular, large or small, broad subulate, ascending; the nearby midrib below with prickles 2.5–3 mm long, 6–15 mm apart, flat arcuate subulate, irregular; on the subulate apex the margins with teeth 0.7–2.5 mm long, 1–4 mm apart, irregular, the smaller straight subulate and salient, white except for the slightly brown tip, the larger ones broad arcuate subulate, ascending, occasionally bidentate; the midrib below with prickles 0.5–1 mm long, 2–5 mm apart, subulate-serrations; pistillate inflorescence terminal, erect, spicate, bearing 9 syncarps attached in three rows; peduncle 30 cm long, 5 cm in diameter, clavate, in section deltoid but the angles obtuse, subtended by two basal, persistent foliaceous bracts 80 cm long, 10 cm wide, and the stalk bearing two caducous bracts; rhachis 18 cm long; syncarps crowded, 12–15.5 cm long, 8.5–9 cm broad, 6–7.5 cm thick, in profile ovoid-cylindric but the proximal face flat or nearly so, bearing 65–71 phalanges in nearly vertical rows; core fleshy and fibrous; phalanges 3–3.5 cm long, 2–3.1 cm wide, 1.7–2.6 cm thick, orange-yellow, obovoid but the base long cuneate obpyramidal, truncate, the upper  $\frac{1}{3}$  free, pyramidal-hemispheric, (5)–6-angled, the apical area truncate or shallow concave, 7–10 mm wide, circular or elliptic, (3–4)–5–7–(8)-celled, very rarely with one central stigma, normally with all on the margins of the apical circle or polygon; stigmas 1.5–2 mm long, brown, papillose, flush, horizontal, cordate to reniform to cordate-ovate, mostly centrifugal, but some tangential, and a few centripetal, prolonged beyond the central crease is a deep sinus about 1 mm long; endocarp median, bony, brown, the lateral walls 3–4 mm thick, the inner surface smooth, shining; seeds 6–8 mm long, broad ellipsoid; apical mesocarp of solid pith, traversed by longitudinal fibers; basal mesocarp fibrous and fleshy.

**HOLOTYPE:** Madagascar, Ile Sainte Marie, Lambountsira, 4 km S of Ambodifototra, forest remnant in cultivated fields, 4 m alt, Aug. 26, 1961, *H. St. John* 26,555 (BISH).

DISCUSSION: *P. centrifugalis* is a member of the section *Dauphinensia*, as is its closest relative, *P. dauphinensis* Martelli, a species with syncarps 18–20 cm long, cylindric, bearing 100 or more phalanges; endocarp submedian; leaves 12 cm or more in width, and especially above tessellate and cross-veined; near the leaf apex the midrib below with crenate-serrations 9–12 mm apart. *P. centrifugalis* has the syncarps 12–15.5 cm long, ovoid-cylindric, bearing 65–71 phalanges; endocarp median; leaves 9–11.6 cm wide, lacking cross veins except at the very base; and near the apex the midrib below with subulate-serrations 2–5 mm apart.

*P. centrifugalis* is native to the thickly settled, offshore islet, Ile Sainte Marie. It is not a littoral species, but it occurs commonly on the coastal plain of the western or leeward shore on coastal sand flats or on upland lateritic soils or on basalt gravels near to or remote from the shore. It makes a good, vigorous tree that is persisting due to its ferociously armed leaves and stems, despite the nearly complete agricultural exploitation of the land for the culture of coconut, breadfruit, clove, mango, vanilla, papaya, and truck crops. There is no remaining virgin forest, though on rough or steep slopes there are patches of vigorous secondary forest, and *Pandanus* persists better than any other tree. The fruits have a pleasant fruity smell, and their phalange bases have a pleasant fruity incipient taste, but then are irritating. Only children, rats, and other animals eat them. The dried side strips of the leaves are used to plait floor mats, baskets, hats, etc.

The new epithet is the Latin *centrifugalis*, being centrifugal, and is given in allusion to the orientation of the stigmas, which is very exceptional in the genus.

*Pandanus circularis* sp. nov. (sect. *Dauphinensia*)

Figs. 254, 255a, 255b top

NOM. VERN.: "hofa."

DIAGNOSIS HOLOTYPE: Arbor 12 m alta 20 cm diametro, cortice obscure brunneo cum spinis conicis, ramulis in apice 10 cm diametro, radicibus fulturosis paucis 20 cm longis 1.5 cm diametro spinosis, foliis 2.35–2.6 m longis 14–15 cm latis crassiter coriaceis sensim recurvantibus apicibus caducis supra olivaceis infra viridibus et glaucis in sectione V-formatis in sectione mediali cum 72 nervis parallelis secundariis

in dimidio quoque nervis tertiis olim ad basem evidentis lamina gladiformatis in apice trigono crassiter subulato diminuentibus eo 10 cm ex apice 8 mm lato basi inermi amplexicauli alba et cum extensionibus lateralibus 16–20 mm latis 33 cm longis integris membranaceis, 26 cm ex basi marginibus cum spinis 5–6 mm longis 6–11 mm separatis crassioriter subulatis subarcuatis adscendentibus pallidis, midnervo proximo infra ex 30 cm cum aculeis 2–2.5 mm longis 5–15 mm separatis subulatis valde reflexis basi crassa, in sectione mediali marginibus cum spinis 3.5–5.5 mm longis 5–18 mm separatis arcuato-subulatis compressis albis adscendentibus, midnervo infra cum spinis simultantibus sed 12–16 mm separatis, in apice marginibus et midnervo infra cum subulato-serrulis 0.6–1 mm longis 1–2.5 mm separatis albis, inflorescentia foeminea terminali erecta spicata cum 9 syncarpiis in 3 seriebus affixis, pedunculo 36 cm longo in apice 5.5 cm. diametro clavato 3-laterato in parte superiori cum 2 bracteis caducis, rhachidi 20 cm longo, syncarpiis 14–18 cm longis 9–10 cm latis 7–8 cm crassis congregatis adscendentibus cylindrico-ovoideis sed latere proximo compresso cum 52–78 phalangibus, axili carnoso et fibroso, phalangibus 3.5–4 cm longis 2.7–3.8 cm latis obovoideis "luteis" in basi truncatis parte  $\frac{1}{4}$ – $\frac{3}{4}$  supera libera oblata obtuso-pyramidalis (5)–6-angulosa concava ellipso apicali cum 4–9 stigmatibus (rariter stigmate unico minori centrali), stigmatibus marginalibus 1.5–2 mm longis ellipticis vel lanceolatis vel deltoideis plerumque centrifugalibus sed paucis tangentialibus vel enim centripetalibus, sinibus 0.5–1 mm longis profundis, endocarpio osseoso brunneo supramediali 14 mm longo lateribus 4–6 mm crassis intra laevibus et lucidis, seminibus 8 mm longis ellipsoideis, mesocarpio apicali meduloso denso cum fibris longitudinalibus paucis, mesocarpio basali carnoso et fibroso.

DIGNOSIS OF HOLOTYPE: Tree, 12 m tall, 20 cm in diameter; bark dark brown, with conic spines; branchlets at apex 10 cm in diameter; prop roots few, 20 cm long, 1.5 cm in diameter, spiny; leaves 2.35–2.6 m long, 14–15 cm wide, thick coriaceous, gently down-curved, all mature leaves having lost their apices, above olive green, below green and glaucous, in section V-shaped, at midsection with 72 parallel secondary veins in each half, no visible tertiary cross veins except at the very base, blade sword-shaped, narrowing to a stout trigonous subulate apex, this 10 cm down 8 mm wide, the base unarmed and amplexicaul, white, and with membranous, entire, lateral flanges 16–20 mm wide and 33 cm long, near the base beginning at 26 cm the margins with spines 5–6 mm long, 6–11 mm apart, very stout subulate, slightly arcuate, ascending, pale; the midrib below beginning at 30 cm with prickles 2–2.5 mm long, 5–15 mm

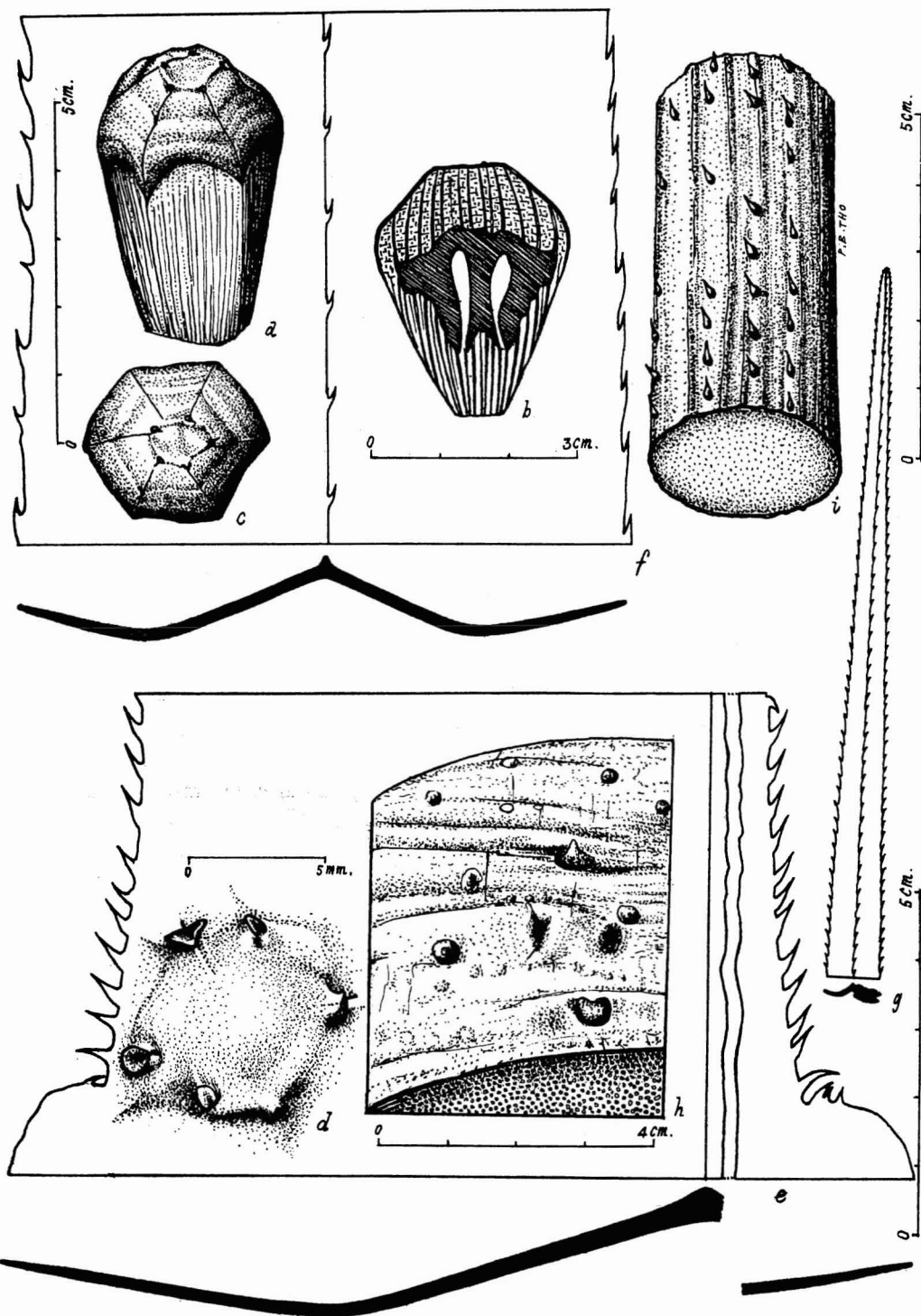


FIG. 254. *Pandanus circularis* St. John, from holotype. *a*, Phalange, lateral view,  $\times 1$ ; *b*, phalange, longitudinal median section,  $\times 1$ ; *c*, phalange, apical view,  $\times 1$ ; *d*, stigmas, apical view,  $\times 4$ ; *e*, half of leaf base, lower side,  $\times 1$ ; *f*, leaf middle, lower side,  $\times 1$ ; *g*, leaf apex, lower side,  $\times 1$ ; *h*, bark of trunk,  $\times 1$ ; *i*, branchlet,  $\times 1$ .



FIG. 255a. *Pandanus circularis* St. John, holotype. Left, base of trunk and prop roots; right, trunk and leaf bases.

apart, subulate, heavy based, strongly reflexed; at midsection the margins with spines 3.5–5.5 mm long, 5–18 mm apart, flattened arcuate subulate, ascending, white; the nearby midrib below with similar spines but 12–16 mm apart; on the subulate apex the margins and midrib below with subulate-serrulations 0.6–1 mm long, 1–2.5 mm apart, white; pistillate inflorescence terminal, erect, spicate, bearing 9 syncarps, these attached in three rows; peduncle 36 cm long, 5.5 cm in diameter at apex, clavate, in section deltoid, but the angles obtuse, the upper part with two caducous bracts; rhachis 20 cm long; syncarps crowded, ascending, 14–18 cm long, 9–10 cm broad, 7–8 cm thick, in profile cylindrical-ovoid, but the proximal face flat or nearly so, bearing 52–78 phalanges in vertical rows; core fleshy and fibrous; phalanges 3.5–4 cm long, 2.7–3.8 cm wide, said to be “yellow,” obovoid, the broad base truncate, upper  $\frac{1}{4}$ – $\frac{1}{3}$  free, oblate obtuse-pyramidal (5)–6-angled, the apical area shallow concave, hexagonal to elliptic, bounded by a distinct rim on which are placed the 4–9 stigmas (though rarely there is

a smaller, central one); marginal stigmas 1.5–2 mm long, elliptic to lanceolate or deltoid, mostly centrifugal, but a few are tangential, and rarely there is a centripetal one, the sinus a deep crack 0.5–1 mm long; endocarp bony, brown, supramedian, 14 mm long, the lateral walls 4–6 mm thick, the inner surfaces smooth, shining; seeds 8 mm long, ellipsoid; apical mesocarp of solid pith, traversed by a few longitudinal fibers; basal mesocarp fleshy and fibrous.

HOLOTYPE: Malagasy Republika, Farankaraina, 14 km NE of Maroantsetra, wooded sandy flat near seashore, 2 m alt, Sept. 2, 1961, *H. St. John* 26,565 (BISH).

DISCUSSION: *P. circularis* is a member of the section *Dauphinensia*, as is its closest relative, *P. erectus* St. John, a Malagasy species with the peduncle 53 cm long; phalanges 2.6–3.1 cm long, 1.5–2.2 cm wide, (2)–3–4-celled; endocarp lateral walls 1 mm thick; leaves 3.2–3.25 m long, 15–16 cm wide, at midsection with 83 parallel secondary veins in each half, and at



FIG. 255b. *Pandanus circularis* St. John, holotype. Top, leaves bent back to show the infructescence; bottom, *Pandanus dauphinensis* Martelli in Martelli & Pic. Ser., grove at seaward edge of dunes, 2 km north of Fort-Dauphin.

midsection the margins with prickles 1.5–2.2 mm long, and 5–11 apart. *P. circularis* has the peduncle 36 cm long; phalanges 3.5–4 cm long, 2.7–3.8 cm wide, 4–9-celled; endocarp lateral walls 4–6 mm thick; leaves 2.35–2.6 m long, 14–15 cm wide, at midsection with 72 secondary parallel veins in each half, and at midsection the margins with spines 3.5–5.5 mm long, 5–18 mm apart.

The new epithet is the Latin *circularis*, in a circle, a name given in reference to the placement of the stigmas on an apical circle or hexagon.

*Pandanus dauphinensis* Martelli in Martelli & Pichi-Sermolli, Inst. Sci. Madagascar, Ser. B, Mém. 3(1):38–40, fig. 5, 1951 (sect. *Dauphinensia*)

Figs. 255b bottom, 256, 257, 261 top left.

DESCRIPTION FROM *St. John* 26,579: Tree 3–8 m tall, 15–20 cm in diameter, branchlets several, 12 cm in diameter below the leaves and clothed for some distance with marcescent leaf bases; crown broad; bark of trunk light brown, with a few conic spines or later with a few ascending rootlets; prop roots none; leaves



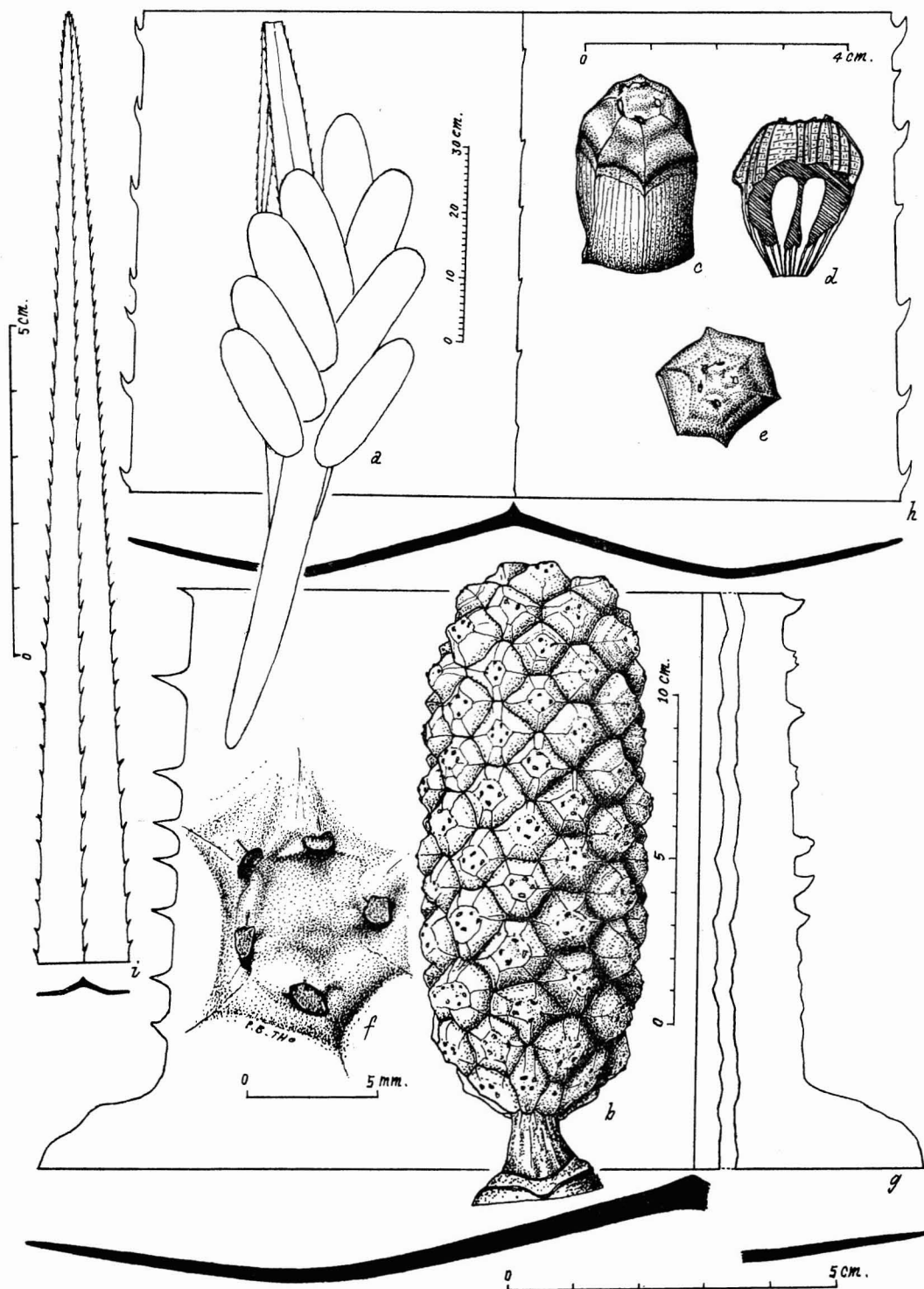


FIG. 256. *Pandanus dauphinensis* Martelli in Martelli & Pic. Ser., from *St. John* 26,579. *a*, Infructescence,  $\times \frac{1}{10}$ ; *b*, syncarp, lateral view,  $\times \frac{1}{2}$ ; *c*, phalange, lateral view,  $\times 1$ ; *d*, phalange, longitudinal median section,  $\times 1$ ; *e*, phalange, apical view,  $\times 1$ ; *f*, stigmas, apical view,  $\times 4$ ; *g*, half of leaf base, lower side,  $\times 1$ ; *h*, leaf middle, lower side,  $\times 1$ ; *i*, leaf apex, lower side,  $\times 1$ .

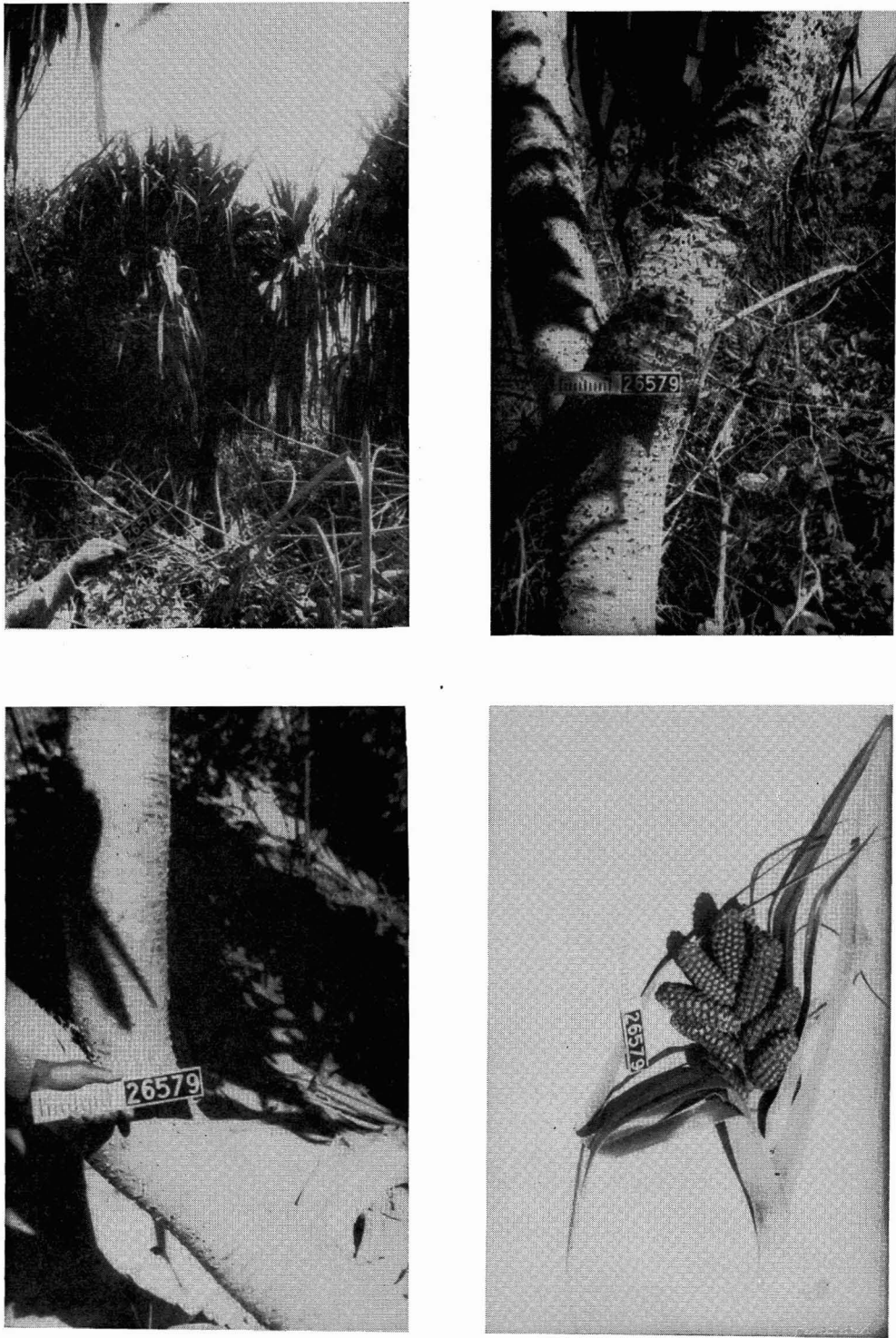


FIG. 257. *Pandanus dauphinensis* Martelli in Martelli & Pic. Ser., from St. John 26,579. Top left, tree in dune hollow; top right, tree trunk; bottom left, tree branches; bottom right, infructescence.



1.85–2.73 m long, 16–17.5 cm wide near the base where the spines begin, 10–10.5 cm wide at the middle, thick coriaceous, gently curved, but breaking across about  $\frac{2}{3}$  of the way out, above olive-green, below light green, broad V-furrowed above the midrib, in the outer half the two lateral quarters horizontal but not pleated, at midsection with 70 parallel secondary veins in each half, no visible tertiary veins, blade sword-shaped, gradually tapering to the stiff, trigonous subulate apex, this at the point 10 cm down 9 mm wide, the base unarmed, white, with entire lateral flanges 25–33 cm long, 12–17 mm wide, membranous margined, beginning at 26–34 cm up the margins with spines 4–7 mm long, 5–15 mm apart, the body conic, greenish, the apex subulate, dark brown, the lower ones divergent, the next ones somewhat ascending; the midrib below beginning at 40 cm up with spines 3–4 mm long, 7–12 mm apart, conic, acute, reflexed; at midsection the margins with spines of two kinds, the larger ones 3.5–5 mm long, 13–20 mm apart, arcuate heavy subulate serrae, white with brown tips, the alternating smaller ones 2–2.8 mm long, 12–17 mm apart, similar; the nearby midrib below with spines like the smaller marginal ones, 1.5–2 mm long, 6–15 mm apart; along the subulate apex the margins with subulate-serrae 1–1.9 mm long, 2–3 mm apart, and often doubly serrate; the midrib below with similar teeth 4–8 mm apart; infructescence terminal, erect, bearing 11 ascending syncarps attached in 3 rows; peduncle 46 cm long, 5.5 cm in diameter at apex, distinctly clavate, 3-sided, with a few leafy bracts, these with an entire sheathing base, then a foliaceous blade 1.63 m long, 12 cm wide at base, tapering all the way to the subulate tip, the margins and midrib below with heavy white spines; rhachis 25 cm long; syncarps crowded, 17.5–21 cm long, 6–7.5 cm in diameter, cylindric, obtuse, but the proximal face flat or nearly so, bearing 96–145 phalanges in mostly vertical rows; core fleshy and fibrous, 15–25 mm in diameter; phalanges 22–25 mm long, 16–23 mm wide, 14–22 mm thick (in a double 34 mm wide and with 11 carpels), still green, but apparently fully grown and as large as the old, fallen ones, becoming yellow, the lower part oblong, upper  $\frac{1}{3}$  free and oblate pyramidal ovoid, 6–

angled, the apical area shallow concave, 6–11 mm wide, circular or elliptic, 3–7-celled, the stigmas always on the periphery; stigmas 1.5–2 mm wide, ovate to reniform or elliptic, brown, papillose, mostly centrifugal, but rarely a few tangential or centripetal, and prolonged beyond the central crease is a deep sinus 0.5–1 mm long; endocarp inframedian, 12–15 mm long, bony, dark brown, the lateral walls 1.5–3 mm thick, the inner surfaces smooth, shining; seeds 6–8 mm long, ellipsoid; apical mesocarp of continuous pith with a few strong longitudinal fibers; basal mesocarp scant, fleshy and fibrous.

HOLOTYPE: Madagascar, "Est: C'est l'espèce la plus commune sur les dunes de la côte littorale de Fort-Dauphin, à Mananjary, Bas Matitanana, Oct. 1911 (Perrier de la Bathie, n° 11888)." (P).

SPECIMEN HERE DESCRIBED: Malagasy Republika, 2 km N of Fort-Dauphin, thicket on coastal sand dunes, with "voanat" (Sapotaceae), "hily" (*Helmiopsis Hily*), *Lycium* sp., and *Ipomoea brasiliensis*, 10 m alt, Sept. 22, 1961, *H. St. John* 26,579 (BISH).

DISCUSSION: *P. dauphinensis* is the type species of the section *Dauphinensia*. The type locality of the species is on the same coast as the collection here described in detail, but a few kilometers to the north. The two collections tally quite well, except that the holotype was described as with phalanges 3 cm long, and the syncarps 8 cm in diameter, but on the isotype (FI) the phalanges are 2.6–3 cm long. Ours are a little narrower, and the phalanges are  $\frac{1}{4}$  shorter. To be sure, ours were not fully ripe, yet they seemed nearly full-sized and their seeds and endocarp were well formed. They were as large as the fallen, weathered ones on the ground. Surrounding trees of other genera were much shattered by a cyclone five months previous, but as usual the *Pandanus* trees survived in good condition. It does not seem likely that all the phalanges seen on the many trees and all the mature, fallen ones would be uniformly smaller owing to the cyclone. In ours the carpels of the lateral phalanges were from 3 to 7.

Later, when in Paris, it was possible to study

the holotype of *P. dauphinensis*, Perrier de la Bathie 11,888. This consists of a dried fruit rhachis; a piece of a leaf 20 cm long, 11 cm wide, and one half of it continuing 55 cm more; a single syncarp 18 cm long, 7 cm in diameter, cylindric but one side flat, complete except that about 9 phalanges have been removed. The phalanges are nearly all 24–26 mm long, only one near basal one on the narrow angular side is 3 cm long. Thus, it is clear that there are no significant differences between this holotypic collection from Bas Matitana and the writer's from Fort-Dauphin, here illustrated.

The specimen here described was in a partly sheltered habitat, in a dune hollow, 75 m back from the beach. The others on dune crests or nearer the beach were wind battered and the syncarps were smaller. They were as small as 12 cm long, and 5 cm in diameter, but they had the same elongate oblong profile.

The inhabitants regularly gather the leaves, especially the larger ones borne by young plants, for the making of mats.

*Pandanus erectus* sp. nov. (sect. *Dauphinensis*)

Figs. 258, 259

NOM. VERN.: "hofa."

DIAGNOSIS HOLOTYPE: Arbor 15 m alta 25 cm diametro, trunco erecto, ramis paucis adscendentibus proxima apicem 0.5–1 m longis 15 cm diametro, cortice brunneo cum spinis conicis brevibus, radicibus fulturosis paucis 20 cm longis 1.5 cm diametro pallide brunneis spinosis, foliis 3.2–3.25 m longis 15–16 cm latis rigidis crassiter coriaceis erectis sed parte  $\frac{1}{3}$  ultima fracta et pendenti supra olivaceis infra pallidioribus et subglaucis supra midnervum late V-sulcatis ultra medium ultimum 2-plicatis, nervis paene evidentibus sed in sectione mediali cum 83 nervis parallelis secundariis in dimidio quoque lamina ligulata sensim in tertia ultima in apice crassiter trigono subulato diminuentibus eo in puncto 10 cm ex apice 5 mm lato basi amplexicauli et inermi alba cum lateribus distentis 38 cm longis 2 cm latis membranaceis, marginibus ex 38 cm cum aculeis 2–2.5 mm longis 3–6 mm separatis subulatis infimis divergentibus alteris adscendentibus, midnervo infra per 90 cm inermi tum cum aculeis 1.5–2.2 mm longis 5–11 mm separatis arcuato-subulatis proxime adscendentibus albis cum apicibus brunneis, midnervo infra cum serrulis 0.6–1 mm longis 3–7 mm separatis cum apicibus brunneis in apice marginibus et midnervo infra cum serrulis 0.2–0.9 mm longis 1–2.5 mm separatis, inflorescentia foeminea terminali erecta spicata cum 10 syncarpiis in 3 seriebus affixis, pedunculo 53 cm longo, in apice 6 cm di-

ametro 3-laterato in basi sustento cum 2 bracteis foliosis 1.7 m longis 8.5 cm latis, rhachidi 23 cm longo, syncarpiis non visis, phalangibus 2.6–3.1 cm longis 1.5–2.2 cm latis 1.4–1.9 cm crassis "lutescentibus" obovoideis vel late ita basi truncata parte  $\frac{1}{3}$  supra libera semiorbiculari (5)–6-angulosa apice concavo elliptico 6–8 mm lato loculis (2)–3–4, stigmatibus plerumque in ellipso 1–1.5 mm longo obliquo elliptico plerumque centrifugalibus sed sine sinu distali, endocarpio 15 mm longo supramediali osseoso brunneo lateribus 1 mm crassis intra laevibus et lucidis, seminibus 5–6 mm longis, mesocarpio apicali minori cum medulla densa et fibris longitudinalibus, mesocarpio basali fibroso et carnoso.

DIAGNOSIS OF HOLOTYPE: Tree 15 m tall, 25 cm in diameter; trunk erect, unbranched almost to the top, the few branches 0.5–1 m long, 15 cm in diameter, strictly ascending; bark brown, with short conic spines; prop roots few, 20 cm long, 1.5 cm in diameter, light brown, spiny; leaves 3.2–3.25 m long, 15–16 cm wide, rigid, thick coriaceous, stiffly erect, but the outer ones  $\frac{1}{3}$  breaking and pendent, olive-green above, paler and somewhat glaucous below, broadly V-furrowed above the midrib, and beyond the middle with 2 lateral pleats, the veins rather obscure but at midsection with 83 parallel secondary veins in each half, blade ligulate, gradually tapering in outer third to a stout, trigonous subulate apex, this about 10 cm down 5 mm wide, the base amplexicaul, unarmed, white, with membranous, entire lateral flanges 38 cm long, 2 cm wide; at base beginning at 38 cm the margins with prickles 2–2.5 mm long, 3–6 mm apart, subulate, diverging, then the upper ones ascending; the midrib below unarmed for 90 cm; at midsection the margins with prickles 1.5–2.2 mm long, 5–11 mm apart, arcuate subulate, closely ascending, white, with small brown tips; the nearby midrib below with serrations 0.6–1 mm long, 3–7 mm apart, brown tipped; on the subulate apex the margins and midrib below with serrations 0.2–0.9 mm long, 1–2.5 mm apart; infructescence terminal, erect, spicate, bearing 10 syncarps attached in three rows; peduncle 53 cm long, 6 cm in diameter at apex, clavate, 3-sided, subtended by two basal, leafy bracts 1.7 m long, 8.5 cm wide; rhachis 23 cm long; syncarps seen only as remnants; phalanges 2.6–3.1 cm long, 1.5–2.2 cm wide, 1.4–1.9 cm thick, said to be "yellow," obovoid or broadly so, the base truncate, upper  $\frac{1}{3}$  free, semiorbicu-

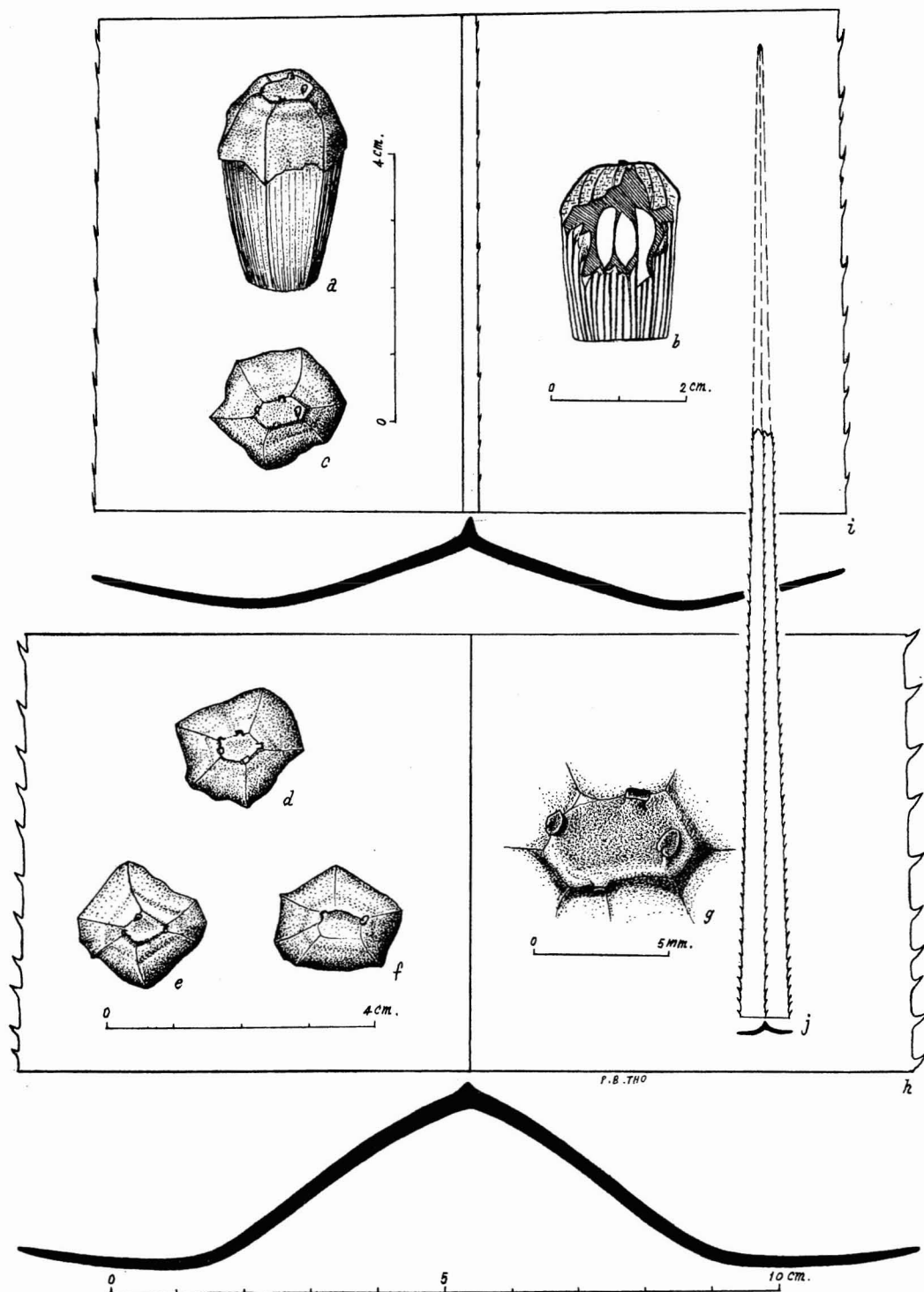


FIG. 258. *Pandanus erectus* St. John, from holotype. *a*, Phalange, lateral view,  $\times 1$ ; *b*, phalange, longitudinal median section,  $\times 1$ ; *c-f*, phalanges, apical view,  $\times 1$ ; *g*, stigmas, apical view,  $\times 4$ ; *h*, leaf base, lower side,  $\times 1$ ; *i*, leaf middle, lower side,  $\times 1$ ; *j*, leaf apex, lower side,  $\times 1$ .

lar, (5)–6-angled, the apical area concave, 6–8 mm wide, polygonal or elliptic, (2)–3–4-celled, the stigmas mostly on the margin of the apical rim; stigmas 1–1.5 mm long, elliptic, oblique, mostly centrifugal, but lacking a projected sinus; endocarp 15 mm long, suprame-dian, bony, brown, the lateral walls 1 mm thick, the inner surface smooth, shining; seeds 5–6 mm long; apical mesocarp sparse, with dense pith and longitudinal fibers; basal meso-carp fibrous and fleshy.

HOLOTYPE: Malagasy Republika, Varingo-hitra, 5 km S of Maroantsetra, secondary forest, with "voapaka" (*Uapaca Thouarsii*), "nanto" (Sapotaceae), and "hintsina" (*Afzelia bijuga*), 5 m alt, 3 Sept. 1961, H. St. John 26,567 (BISH).

SPECIMENS EXAMINED: Malagasy Republika, Varingohitra, with same data, H. St. John 26,566 (BISH).

DISCUSSION: *P. erectus* is a member of the

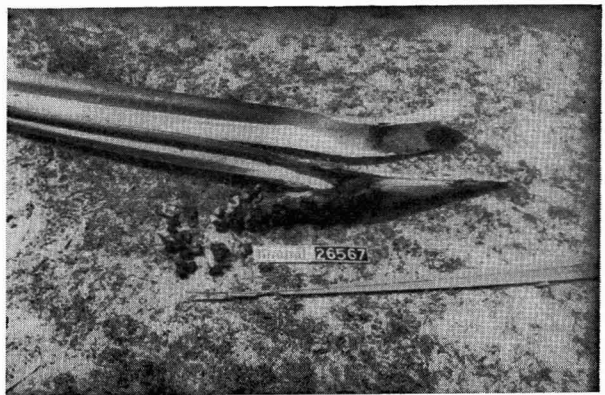
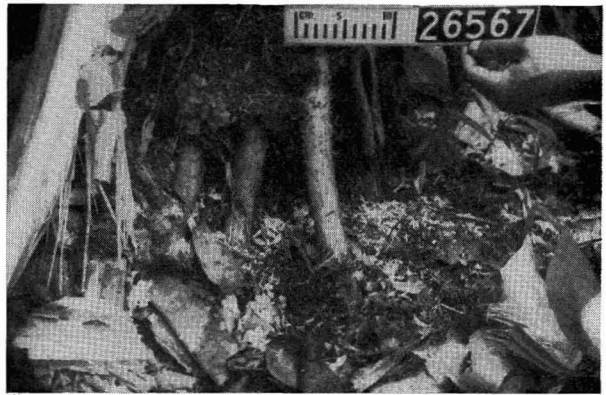
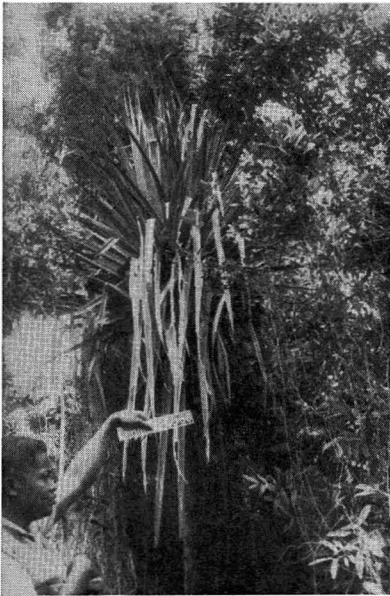


FIG. 259. *Pandanus erectus* St. John, holotype. Top left, trunk and crown of tree; top right, prop roots; bottom left, trunk and bark; bottom right, infructescence with shedding phalanges.

section *Dauphinensia*, as is its closest relative, *Pandanus centrifugalis* St. John, from Ile Ste. Marie, a species which has the phalanges (3-4)-5-7-(8)-celled, 3-3.5 cm long, 2-3.1 cm wide; stigma 1.5-2 mm long; endocarp with lateral walls 3-4 mm thick; tree with wide crown; leaves 1.58-1.65 m long, 9-11.6 cm wide, at midsection with 58 parallel secondary veins in each half, and the margin beginning 15-20 cm from the base with spines 6-8 mm long. *P. erectus* has the phalanges (2)-3-4-celled, 2.6-3.1 cm long, 1.5-2.2 cm wide; stigmas 1-1.5 mm long; endocarp with lateral walls 1 mm thick; tree with the few branches strictly ascending; leaves 3.2-3.25 m long, 15-16 cm wide, at midsection with 83 parallel secondary veins in each half, and the margins beginning 38 cm from the base with prickles 2-2.5 mm long.

In *P. erectus* but few of the phalanges fall to the ground, as most are caught and held in the leaf axils. Some germinate there, and may fall to the ground when the holding leaf falls. Several examples of this were observed on the collection *St. John 26,566*.

The new epithet is the Latin adjective *erectus*, erect, and is given in reference to the strictly ascending branches.

*Pandanus spicatus* sp. nov. (sect. *Dauphinensia*)

Figs. 260, 261 *top right* and *bottom left*

NOM. VERN.: "vacoua madik" (= *Pandanus* small).

DIAGNOSIS HOLOTYPE: Arbor 8 m alta 15 cm diametro cum ramis pluribus suberectis eis in apice 15 cm diametro et cum restis marcescentibus foliarum obtectis, cortice pallide brunneo cum spinis multis late conicis, radicibus fulurosus nullis, foliis 1.6-3.2 m longis 15-16.5 cm latis ligulatis crassiter coriaceis subclucidis supra obscure olivaceis infra olivaceis supra midnervum late U-sulcatis 2-plicatis in sectione mediali cum 96-97 nervis parallelis secundariis in dimidio quoque nervis tertiis nullis lamina in apice valido trigono subulato subiter contracto eo 10 cm ex apice 18 mm lato basi amplexicauli inermi rosacea, marginibus ex 21-26 cm cum spinis 3-5 mm longis 4-16 mm separatis valide subulatis ex basi conica lata adscendentibus infimis rosaceis alteris subviridibus, midnervo infra ad medium vel ultra inermi, in sectione mediali marginibus cum spinis 3-3.5 mm longis 8-26 mm separatis valide arcuato-subulatis compressis valde adscendentibus viridibus cum apice breve brunneo et olim margine uno cum spinis brevioribus vel enim in parte inermi, midnervo infra in

sectione mediali vel distancia parva ultra cum aculeis 1.5-2 mm longis 7-14 mm separatis subulatis subviridibus proxime adscendentibus, in apice marginibus et midnervo infra cum subulato-serris 0.7-1 mm longis 2-5 mm separatis, infructescencia terminali erecta cum circa 9 syncarpiis in fascicula foliarum clausis et paene drupis omnibus retentis, pedunculo 20 cm longo 2 cm diametro carnosio, syncarpiis circa 9 cm longis et 7 cm diametro ovoideis compressis cum drupis multis, eis 20-26 mm longis 10-20 mm latis 10-17 mm crassis (sed in geminis 27 mm latis et 6-7-loculatis) licet luteis cuneatis vel obovoideis 3-5-loculatis parte  $\frac{1}{4}$  supera libera laevibus lateribus contiguis subplanis, stigmatibus 2-2.5 mm latis cordatis horizontalibus exproctentibus brunneis papillois circa apicem congregatis, inter stigmata licet cum valleculis vadosis, endocarpio centrali 10 mm longo pallide brunneo osseoso lateribus lateralibus 1.5-2 mm crassis intra transverse rugosis et cum projectione apicali in locula omnia, mesocarpio apicali cum fibris longitudinalibus fortibus, mesocarpio basali fibroso et carnosio.

DIAGNOSIS OF HOLOTYPE: Tree 8 m tall, 15 cm in diameter, with several suberect branches, these at apex 15 cm in diameter and long clothed with persistent leaf bases; bark light brown, with numerous broad conic spines; prop roots none; leaves 1.6-3.2 m long, 15-16.5 cm wide, ligulate, thick coriaceous, somewhat shiny, above dark olive-green, below olive-green, with a broad U-shaped furrow above the midrib and two lateral pleats, at midsection with 96-97 parallel secondary veins in each half, no visible tertiary cross veins, the blade abruptly narrowed to a stout trigonous subulate apex, this 10 cm down 18 mm wide, the base amplexicaul, unarmed, pink, but beginning 21-26 cm up the margins with spines 3-5 mm long, 4-16 mm apart, stout subulate, ascending from a broad conic base, the lowest pink, the next greenish, the midrib below unarmed to or beyond the middle; at midsection the margins with spines 3-3.5 mm long, 8-26 mm apart, heavy arcuate subulate, flattened, strongly ascending, green, with short brown tips, and not infrequently one of the margins has shorter spines or even in places is unarmed for a short span; the midrib below, beginning at or shortly above the middle, with prickles 1.5-2 mm long, 7-14 mm apart, subulate, closely ascending, greenish; near the apex the margins and midrib below with subulate-serrations 0.7-1 mm long, 2-5 mm apart; infructescence terminal, erect, bearing about 9 syncarps, concealed in the large plume of erect or ascending leaves which trap the

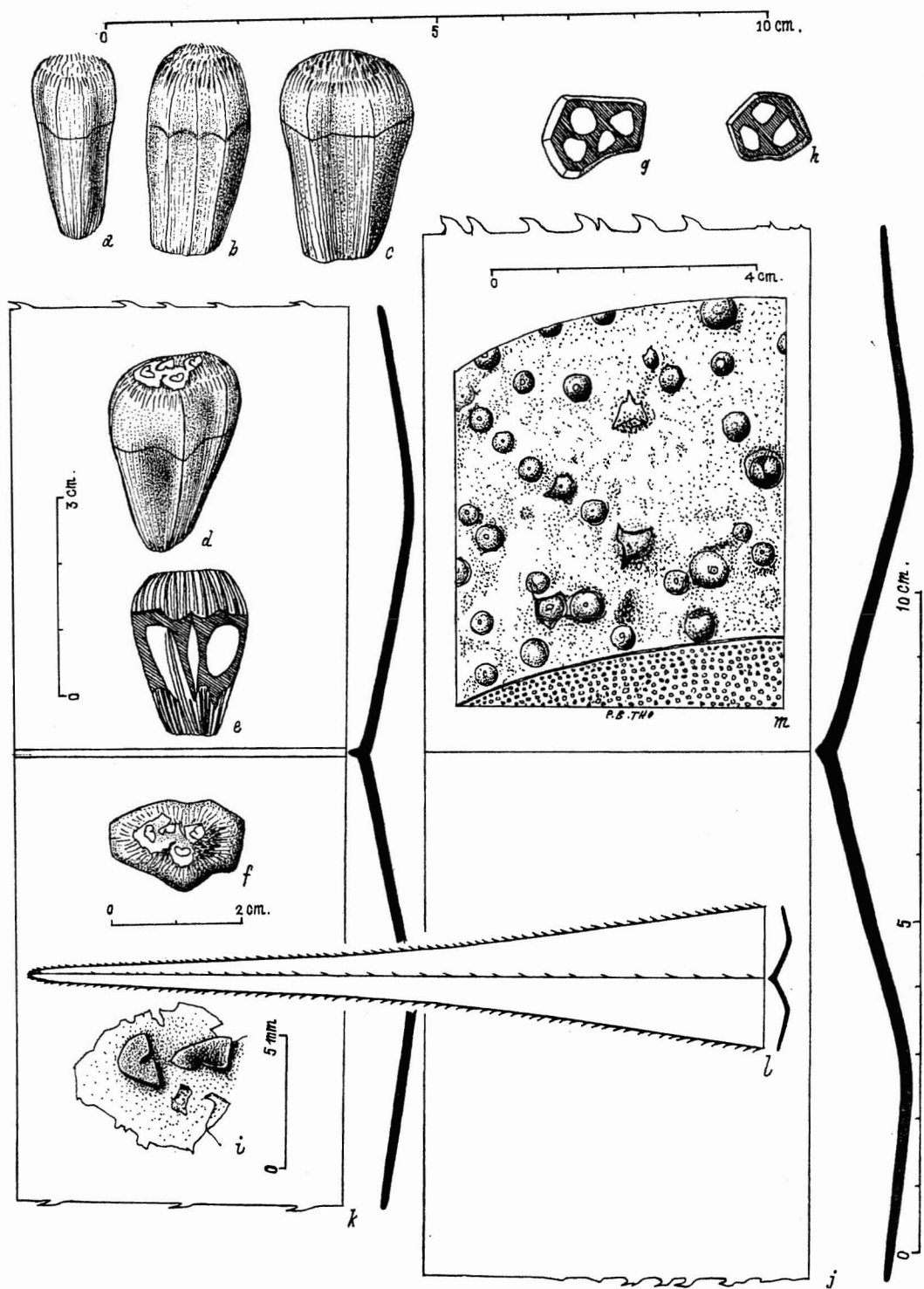


FIG. 260. *Pandanus spicatus* St. John, from holotype. *a-d*, Phalanges, lateral view,  $\times 1$ ; *e*, phalange, longitudinal median section,  $\times 1$ ; *f*, phalange, apical view,  $\times 1$ ; *g-h*, phalanges, median transverse section,  $\times 1$ ; *i*, stigmas, apical view,  $\times 4$ ; *j*, leaf base, lower side,  $\times 1$ ; *k*, leaf middle, lower side,  $\times 1$ ; *l*, leaf apex, lower side,  $\times 1$ .



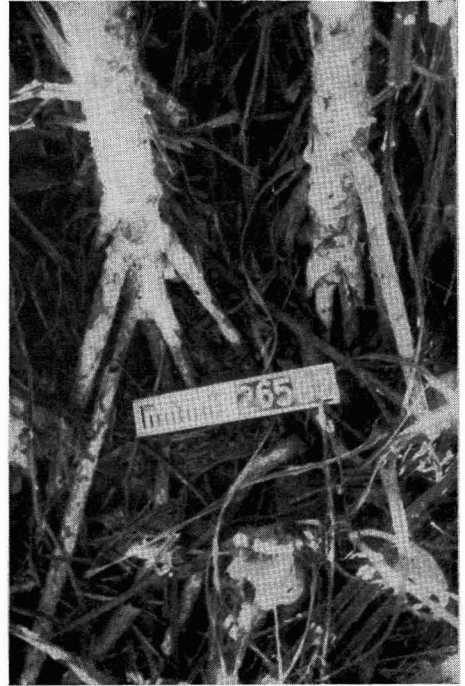
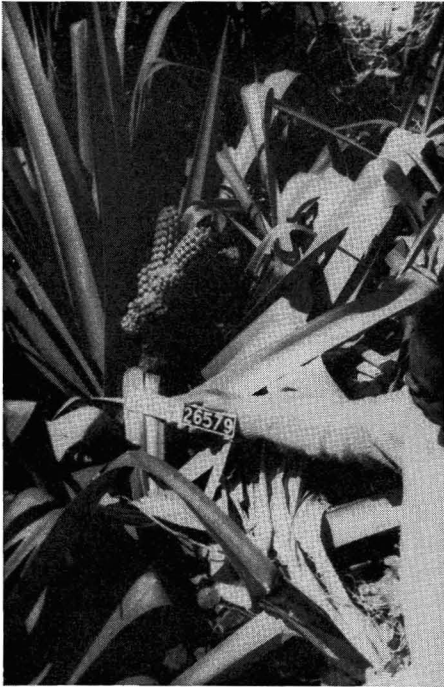


FIG. 261. Top left, *Pandanus dauphinensis* Martelli in Martelli & Pic. Ser., fruiting branch from St. John 26,579; top right, *Pandanus spicatus* St. John, holotype, view of trunk; bottom left, *Pandanus spicatus* St. John, holotype, branch with leaf bases; bottom right, *Pandanus aridus* St. John, holotype, two trunk bases, with prop roots.



drupes but few of which fall to the ground when shed; peduncle 20 cm long, 2 cm in diameter, fleshy; syncarps about 9 cm long and 7 cm in diameter, ovoid, compressed, bearing numerous drupes, these 20–26 mm long, 10–20 mm wide, 10–17 mm thick (but in doubles 27 mm wide and with 6–7 cells), apparently yellow, cuneate to obovoid, 3–5-celled, upper  $\frac{1}{4}$  free, the surface smooth, the contiguous sides nearly flat; stigmas 2–2.5 mm wide, cordate, horizontal, flush, brown, papillose, approximate near the apex; endocarp central, 10 mm long, pale brownish, bony, the lateral walls 1.5–2 mm thick, the inner surfaces transversely rugose, each cell bearing an acuminate projection toward the stigma; apical mesocarp with strong longitudinal fibers; basal mesocarp fibrous and fleshy.

HOLOTYPE: Malagasy Republika, Gravirage, 7 km SW of Joffreville, Montagne d'Ambre, dense moist forest with "rami" (*Canarium Boivini*), and "ambora" (*Tambourissa* sp.), 1,000 m alt, 14 Sept. 1961, H. St. John 26,577 (BISH).

DISCUSSION: *P. spicatus* is a member of the section *Dauphinensis*, as is its closest relative, *P. dauphinensis* Martelli in Martelli & Pic. Ser., of coastal southeastern Madagascar, a species with the peduncle 46 cm long, 5.5 cm in diameter; syncarps 17.5–21 cm long, cylindric; phalanges 16–23 mm wide, the upper  $\frac{1}{3}$  free; endocarp smooth within; leaves at midsection with 70 parallel secondary veins in each half, the midrib below beginning at 40 cm up with spines 3–4 mm long, 7–12 mm apart, conic, acute, reflexed; at midsection the margins with spines of two kinds, the larger ones 3–5 mm long, and alternating with smaller ones 2–2.8 mm long. *P. spicatus* has the peduncle 20 cm long, 2 cm in diameter; syncarps about 9 cm long, ovoid; phalanges 10–20 mm wide, the upper  $\frac{1}{4}$  free; endocarp rugose within; leaves at midsection with 96–97 parallel secondary veins in each half, the midrib below unarmed to or beyond the middle; at midsection the margins with uniform spines 3–3.5 mm long.

The new epithet is the Latin adjective, *spicatus*, spike-bearing, and is given with reference to the spicate inflorescence.

### Section *Mammillarisia*

#### *Pandanus aridus* sp. nov. (sect. *Mammillarisia*)

Figs. 262, 261 bottom right, 264 top left and right

NOM. VERN.: "fandraña."

DIAGNOSIS HOLOTYPE: Frutex multiramosa, caulibus 7 m altis 4 cm diametro, cortice griseo acute spinoso, radicibus fulturosus paucis 20–30 cm longis 2 cm diametro, foliis 35–45 cm longis 16–20 mm latis subcoriaceis gradatim arcuatis supra obscure olivaceis infra pallide viridibus et glaucis supra midnervum anguste V-sulcatis deinde planis in sectione mediali cum 17 nervis parallelis secundariis nervis tertiis transversis nullis lamina ligulata sed dimidia ultima diminuenti in apice trigono subulato eo 10 cm ex apice 6.5 mm lato basi amplexicauli et inermi alba sed ex 1.3–2 cm marginibus cum aculeis 2–2.3 mm longis 2–12 mm separatis deltoideo-subulatis adscendentibus albis sed apicibus brunneis, midnervo infra ex 3.5–4 cm cum aculeis 1.3–2 mm longis 4–11 mm separatis albis subulatis valde reflexis, in sectione mediali marginibus cum aculeis 0.5–0.9 mm longis 7–13 mm separatis gracilibus subulatis divergentibus albis, in apice subulato marginibus et midnervo infra cum subulato-serrulis 0.3–0.7 mm longis 1.5–4 mm separatis, inflorescentia foeminea terminali erecta cum syncarpio unico, pedunculo 8 cm longo 8 mm diametro 3-laterato folioso-bracteato et in apice cum 6 bracteis marcescentibus exteriori 2.5 cm longa 1 cm lata elliptica naviculari marginibus spinoso-fimbriatis, syncarpio 5.5–6 cm diametro globoso viridi cum 21 phalangibus eis 22–25 mm longis 12–23 mm latis 10–22 mm crassis obovoideis firme connatis parte  $\frac{3}{4}$  supra libera subpyramidal-conica 5–6-angulosis 2–4-loculatis apice lobato sinibus 0.5 mm profundis, stigmatibus 1–1.5 mm latis cordatis obscure brunneis papillosis centripetalibus horizontalibus minime elevatis congregatis, endocarpio 13–14 mm longo supramediali brunneo osseoso solido obovoideo lateribus lateralibus 2 mm crassis intra pallidis laevibus lucidis, seminibus 6–8 mm longis ellipsoideis, mesocarpio apicali parvo medullosa et cum fibris paucis, mesocarpio basali carnosum et fibroso.

DIAGNOSIS OF HOLOTYPE: Shrub with many stems, 7 m tall, 4 cm in diameter; bark gray, sharp spiny; prop roots few, 20–30 cm long, 2 cm in diameter; leaves 35–45 cm long, 16–20 mm wide, subcoriaceous, gently curving, above dark olive-green, below pale green and glaucous, above the midrib with a narrow V-shaped furrow, otherwise nearly plane, at midsection with 17 parallel secondary veins in each half, no tertiary cross veins, blade ligulate but the outer half tapering to a trigonous, subulate apex, this 10 cm down 6.5 mm wide, the base amplexicaul, unarmed, white, but begin-

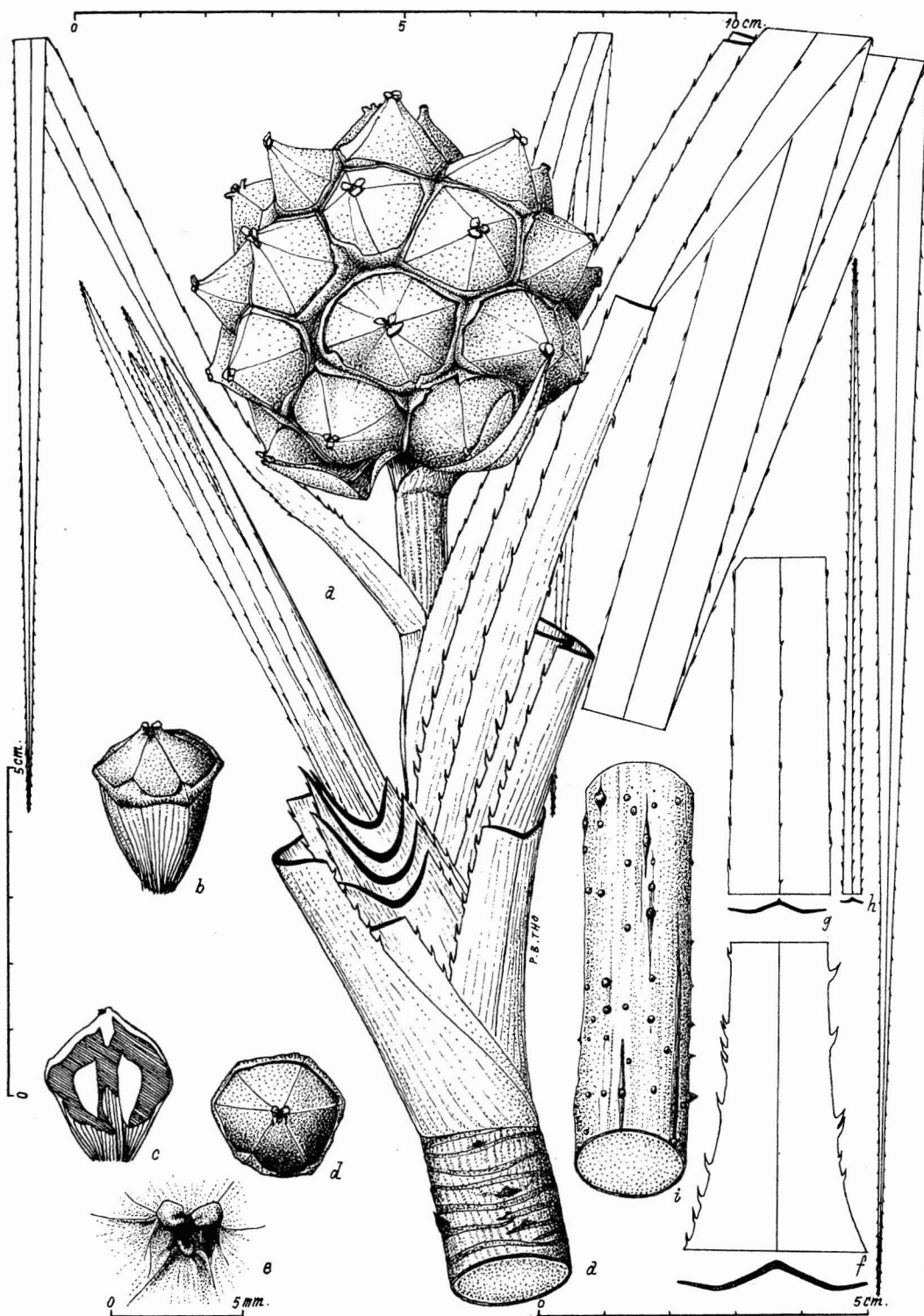


FIG. 262. *Pandanus aridus* St. John, from holotype. *a*, Fruiting branch,  $\times 1$ ; *b*, phalange, lateral view,  $\times 1$ ; *c*, phalange, longitudinal median section,  $\times 1$ ; *d*, phalange, apical view,  $\times 1$ ; *e*, stigmas, apical view,  $\times 4$ ; *f*, leaf base, lower side,  $\times 1$ ; *g*, leaf middle, lower side,  $\times 1$ ; *h*, leaf apex, lower side,  $\times 1$ .

ning at 1.3–2 cm the margins with prickles 2–2.3 mm long, 2–12 mm apart, deltoid subulate, ascending, white with brownish tips; the midrib below beginning at 3.5–4 cm with prickles 1.3–2 mm long, 4–11 mm apart, subulate, reflexed, close, white; at midsection the margins with prickles 1–1.8 mm long, 6–15 mm apart, subulate, arcuate ascending, white; the midrib below with prickles 0.5–0.9 mm long, 7–13 mm apart, slender subulate, divergent, white; on the subulate tip the margins and midrib below with subulate serrulations 0.3–0.7 mm long, 1.5–4 mm apart; pistillate inflorescence terminal, erect, bearing a solitary syncarp; peduncle 8 cm long, 8 mm in diameter, 3-sided, leafy bracted, and at the apex with 6 marcescent bracts, the outer one 2.5 cm long, 1 cm wide, elliptic, navicular, the margins spiny fimbriate; syncarp 5.5–6 cm in diameter, globose, green, bearing 21 phalanges, these 22–25 mm long, 12–23 mm wide, 10–22 mm thick, obovoid, firmly connate, upper  $\frac{1}{3}$  free, slightly pyramidal conic, 5–6-angled, 2–4-celled, lobed about 0.5 mm deep between the apices of the carpels; stigmas 1–1.5 mm wide, cordate, dark brown, papillose, centripetal, horizontal, slightly raised, congregate; endocarp 13–14 mm long, supramedian, brownish, bony, massive, obovoid, the lateral walls 2 mm thick, the inner surfaces pale, smooth, shining; seeds 6–8 mm long, ellipsoid; apical mesocarp scant, of pith and a few fibers; basal mesocarp fleshy and fibrous.

**HOLOTYPE:** Malagasy Republika, Ranomainty, 18 km E of Amboasary, W of Fort-Dauphin, dry arid scrub with *Euphorbia* sp., *Croton* sp., 175 m alt, Sept. 26, 1961, *H. St. John* 26,582 (BISH).

**DISCUSSION:** *P. aridus* is a member of the section *Mammillarisia*, as is its closest relative, *P. saxatilis* Martelli, of northern Madagascar, a species with the phalanges 23–27 mm long, the upper  $\frac{1}{2}$  free; endocarp occupying almost the whole interior of the phalange; lower bract of the inflorescence 2 cm wide; prop roots none. *P. aridus* has the phalanges 22–25 mm long, the upper  $\frac{1}{3}$  free; endocarp 13–14 mm long, slightly supramedian, occupying about  $\frac{2}{3}$  of the interior of the phalange; basal mesocarp 7 mm long; lower bract of the inflorescence 1 cm

wide; prop roots few, 20–30 cm long, 2 cm in diameter.

The new epithet is the Latin adjective, *aridus*, dry, and is given with reference to the dry forest habitat.

*Pandanus connatus* sp. nov. (sect. *Mammillarisia*)

*P. acuminatus* Hort. ex Wendl., Ind. Palm. 45, 1854, nomen nudum.

*Vinsonia acuminata* Gaud. ex Warb., Engler's Pflanzenreich IV,9:89, 1900, nomen nudum, published in synonymy.

Figs. 263, 264 bottom left and right

NOM. VERN.: "vacoua madik" (= *Pandanus* small).

**DIAGNOSIS HOLOTYPE:** Arboriformata 10 m alta 9 cm diametro, cortice brunneo cum spinis conicis brevibus, ramulis 2.5 cm diametro, radicibus fultrosis nullis, foliis 90–109 cm longis 2–2.3 cm latis crassiter sed non fractis ligulatis subcoriaceis supra obscure olivaceis infra intense viridibus supra midnervum sillonatis V-formatis et in media ultima 2-plicatis in sectione mediali cum 23–27 nervis parallelis secundariis in dimidio quoque nervis tertiis solum in basi in tertia ultima sensim in apice trigono subulato diminuentibus eo in puncto 10 cm ex apice 6 mm lato basi amplexicauli inermi sed ex 6–7.5 cm marginibus cum aculeis 1.5–2.5 mm longis 3–8 mm separatis crassiter arcuato-subulatis adscendentibus albis cum apicibus brunneis, midnervo infra per  $\frac{2}{3}$  partem inermi, in sectione mediali marginibus cum serrulis 0.3–0.9 mm longis 3–7 mm separatis albis cum apicibus brunneis, in apice marginibus et midnervo infra cum serrulis 0.2–0.5 mm longis 1–3.5 mm separatis albis cum apicibus brunneis, inflorescentia foeminea erecta terminali, pedunculo 8 cm longo in apice 2 cm diametro clavato trigono folioso-bracteato, bracteis superis 4–5 cm longis 2.5–3 cm latis deltoideis subulatis ciliatis papyraceis quando siccis brunneis, syncarpio solitario 9.5 cm diametro globoso cum 79 phalangibus eis 3.3–3.5 cm longis 1.6–2.1 cm latis 1.3–1.7 cm crassis connatis oblanceoloideis compressis 1–3-loculatis 5–6-angulosis laevibus lucidis parte  $\frac{1}{3}$  supera libera lateribus liberis subcurvatis illis contiguis planis, apicibus cum 2–3 stigmatibus cum vallecule 0.5 mm profunda subclausa, stigmatibus 1.5 mm diametro asymmetricalibus cordatis horizontalibus superficialibus pallide brunneis papillosis, endocarpio 20–23 mm longo supramediali osseoso brunneo cum humeris medialibus latis lateribus 5–6 mm crassis intra laevibus et lucidis, seminibus 10–12 mm longis lineari-ellipsoideis, mesocarpio apicali medullosa et cum fibris paucis, mesocarpio basali fibroso et carnoso.

**DIAGNOSIS OF HOLOTYPE:** Tree-like, 10 m tall, 9 cm in diameter; bark brown, with short conic spines; branchlets 2.5 cm in diameter; prop roots none; leaves arching and recurving,

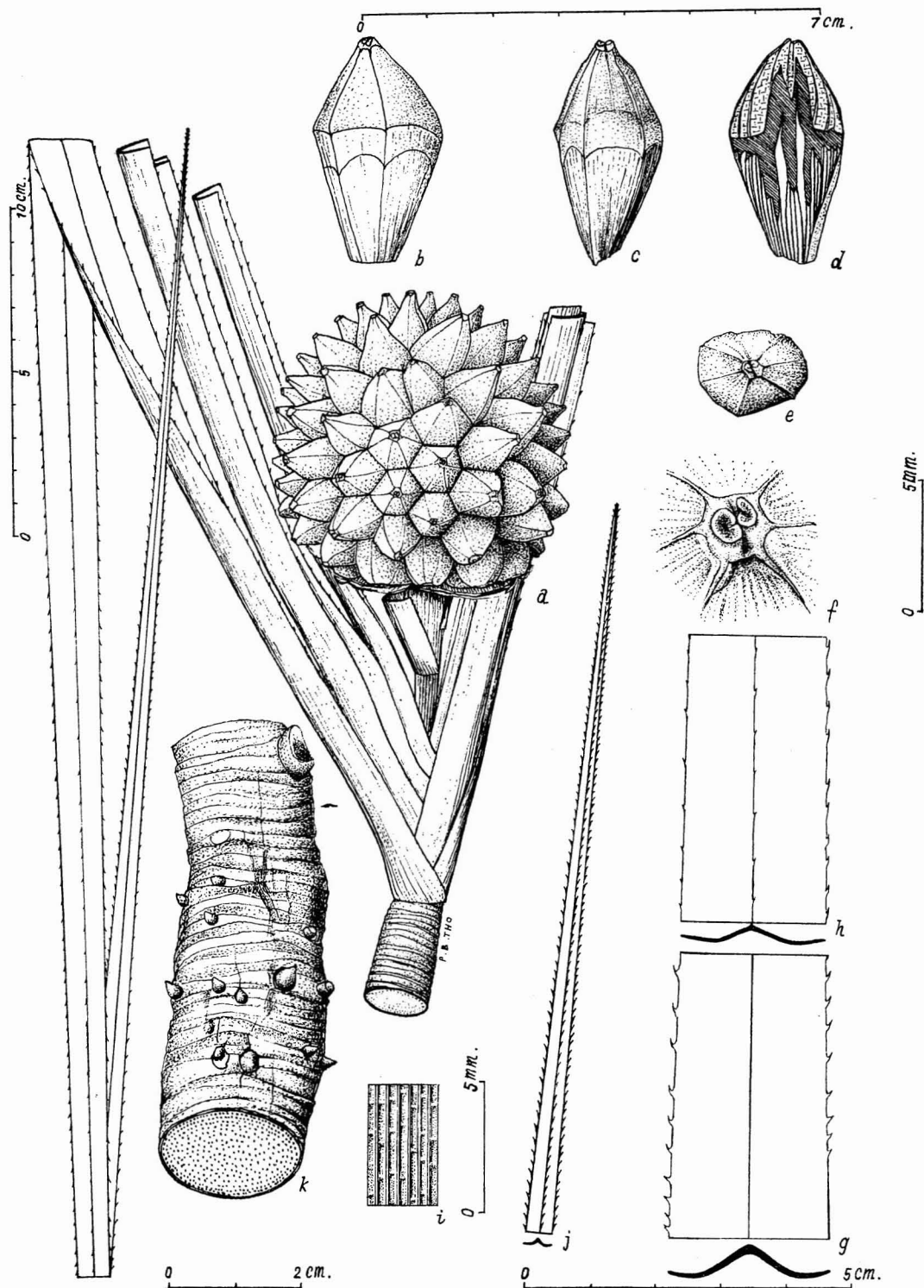


FIG. 263. *Pandanus connatus* St. John, from holotype. *a*, Fruiting branch,  $\times \frac{1}{2}$ ; *b-c*, phalanges, lateral view,  $\times 1$ ; *d*, phalange, longitudinal median section,  $\times 1$ ; *e*, phalange, apical view,  $\times 1$ ; *f*, stigmas, apical view,  $\times 4$ ; *g*, leaf base, lower side,  $\times 1$ ; *h*, leaf middle, lower side,  $\times 1$ ; *i*, secondary and tertiary veins, near the leaf base,  $\times 4$ ; *j*, leaf base, lower side,  $\times 1$ .

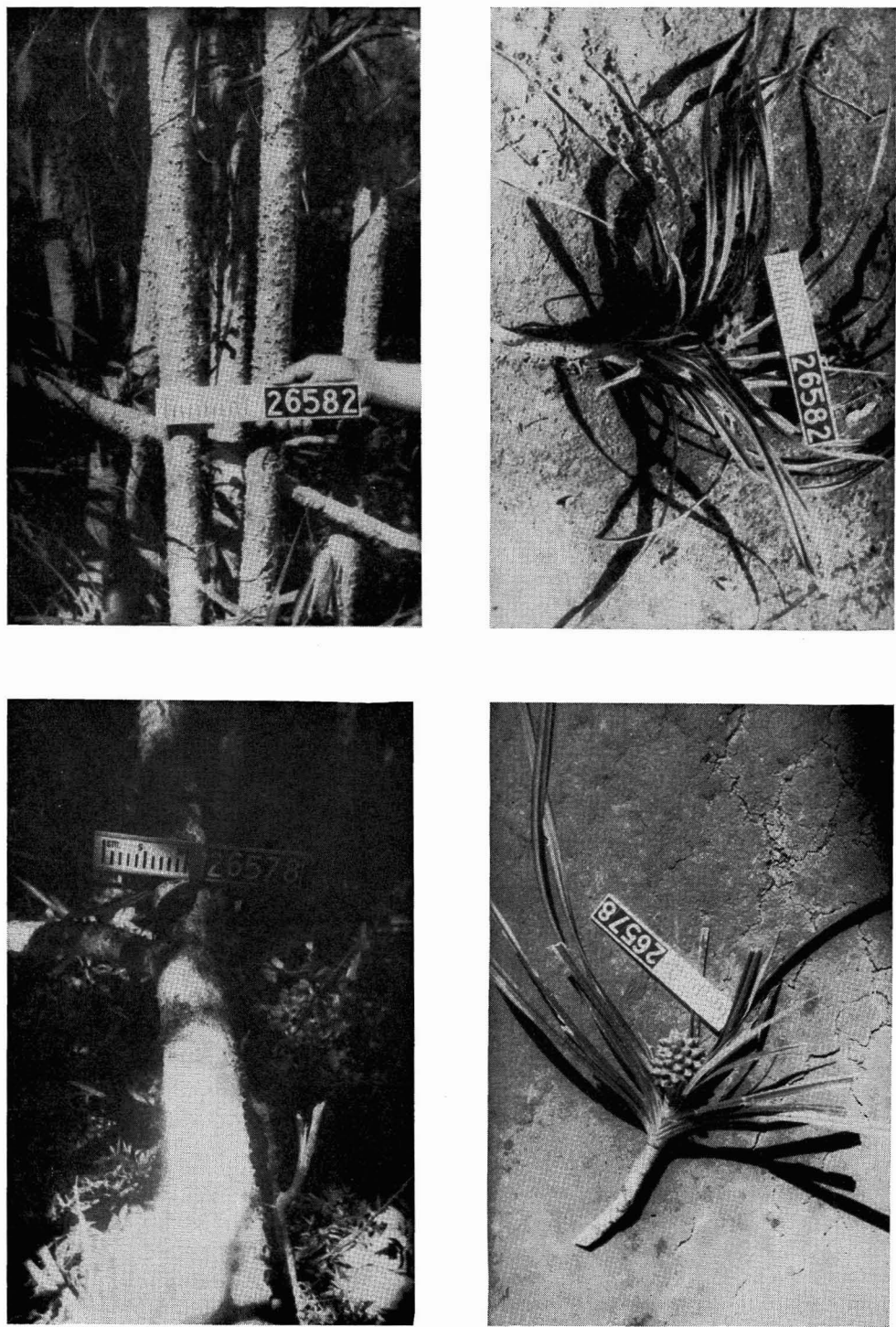


FIG. 264. Top left, *Pandanus aridus* St. John, holotype, two trunks; top right, fruiting branch; bottom left, *Pandanus connatus* St. John, holotype, trunk; bottom right, fruiting branch.



not breaking across, 90–109 cm long, 2–2.3 cm wide, ligulate, subcoriaceous, above dark olive-green, below bright green, with a broad V-shaped furrow above the midrib and beyond the middle with two lateral pleats, at midsection with 23–27 parallel secondary veins in each half, with tertiary cross veins only in the sheathing base, in the outer third the blade gradually narrowing to a trigonous subulate apex which 10 cm down is 6 mm wide, the base amplexicaul, unarmed, but beginning 6–7.5 cm up the margins with prickles 1.5–3.5 mm long, 3–8 mm apart, stout arcuate subulate, ascending, white with brown tips; the midrib below unarmed to the outer third; at midsection the margins with serrulations 0.3–0.9 mm long, 3–7 mm apart, white with brown tips; on the subulate apex the margins and midrib below with serrulations 0.2–0.5 mm long, 1–3.5 mm apart, white with brownish tips; pistillate inflorescence erect, terminal; peduncle 8 cm long, 2 cm in diameter at apex, clavate, trigonous, leafy bracted, the upper bracts 4–5 cm long, 2.5–3 cm wide, deltoid, subulate ciliate, papyraceous, drying brown; syncarp solitary, 9.5 cm in diameter, globose, bearing 79 phalanges, these 3.3–3.5 cm long, 1.6–2.1 cm wide, 1.3–1.7 cm. thick, connate, oblanceoloid, compressed, 1–3-celled, 5–6-angled, the surface smooth, shining, upper  $\frac{1}{3}$  free, the contiguous sides flat, the free part with gently curving surfaces, when several-celled with a narrow, almost closed valley 0.5 mm deep; stigmas 1.5 mm in diameter, asymmetrically cordate, horizontal, flush, light brown, papillose; endocarp 20–23 mm long, supramedian, bony, brown, with broad median flanges, the lateral walls 5–6 mm thick, the inner surfaces smooth, shining; seeds 10–12 mm long, linear ellipsoid; apical mesocarp of dense pith and a few fibers; basal mesocarp fibrous and fleshy.

HOLOTYPE: Malagasy Republika, near Jardin Botanique, Gravrage, 6 km SW of Joffreville, Montagne d'Ambre, 1,000 m alt, native forest, 14 Sept. 1961, *H. St. John* 26,578 (BISH).

SPECIMENS EXAMINED: Madagascar?, *C. Gaudichaud* (FI, P); Madagascar, 1903, *de Vilmorin* (FI).

DISCUSSION: *P. connatus* is a member of the section *Mammillarisia*, as is its closest relative,

*P. vanDamii* Martelli & Pic. Ser., a species of Madagascar which has the peduncle 18–20 cm long; phalanges 35–40 mm long, 20–28 mm wide, (2)–3–4–(5–7)-celled; endocarp 11–12 mm long, the apex irregularly convex; and the leaves 40 cm. long, 2–5 cm wide. *P. connatus* has the peduncle 8 cm long; phalanges 33–35 mm long, 16–21 mm wide, 1–3-celled; endocarp 20–23 mm long, with a long, conic, central apex; and the leaves 90–109 cm long, 2–2.3 cm wide.

The binomials *Pandanus acuminatus* Hort. ex Wendl. and *Vinsonia acuminata* Gaud. ex Warb. were both nomina nuda. In the herbarium at Paris is a specimen with an original label by Gaudichaud, "*Vinsonia acuminata* Ch.G., mss. ?Madagascar??" It consists of six loose, somewhat eroded phalanges that well match those of *P. connatus*. A duplicate of this consists of  $5\frac{1}{2}$  phalanges (FI). On the voyage of La Bonite, Gaudichaud obtained most of his Madagascar specimens by gift from A. Pervillé, formerly a gardener at the Paris Jardin des Plantes, later a voyager to the Seychelles and Nosy-bé, and then a colonist in Madagascar.

The new epithet is the Latin adjective *connatus*, joined or united, and is given with reference to the connate carpels.

#### Section *Microstigma*

##### *Pandanus subglobosus* sp. nov. (sect. *Microstigma*)

Figs. 265, 266.

DIAGNOSIS HOLOTYPE: Frutex, caule 5–7 m longo 3–4 cm diametro in media plus minusve horizontali cum radicibus fulturosus multis, cortice brunneo remote breviter spinoso, ramulis 7–8 mm diametro multis, horizontalibus vel adscendentibus, radicibus fulturosus 2–3 m longis 2 cm diametro viridibus vel griseis muricatis, foliis 28–42 cm longis 4–7 mm latis supra viridibus infra pallide viridibus cum nervis obscure viridibus in sectione mediali cum 8–9 nervis parallelis secundariis in dimidio quoque nervis tertiis nullis supra midnervum late sulcatis explicatis lamina ligulata sed parte  $\frac{1}{3}$  ultima sensim in apice 10–15 cm longo compresso subulato diminuenti eo 10 cm ex apice 2–3 mm lato basi amplexicauli inermi in toto viridi, aculeis omnibus albis translucetibus, ex 9–10 mm marginibus cum aculeis inferioribus 0.8–1.2 mm longis 1.5–3 mm separatis obliquiter deltoideis subadscendentibus sequentibus 1.3–2 mm longis 2–6 mm separatis arcuato-subulatis adscendentibus basibus deltoideis, ex 4–5 cm midnervo infra cum aculeis 0.5–0.6 mm longis 2–5 mm separatis arcuatis subulatis adscendentibus, in sectione mediali marginibus

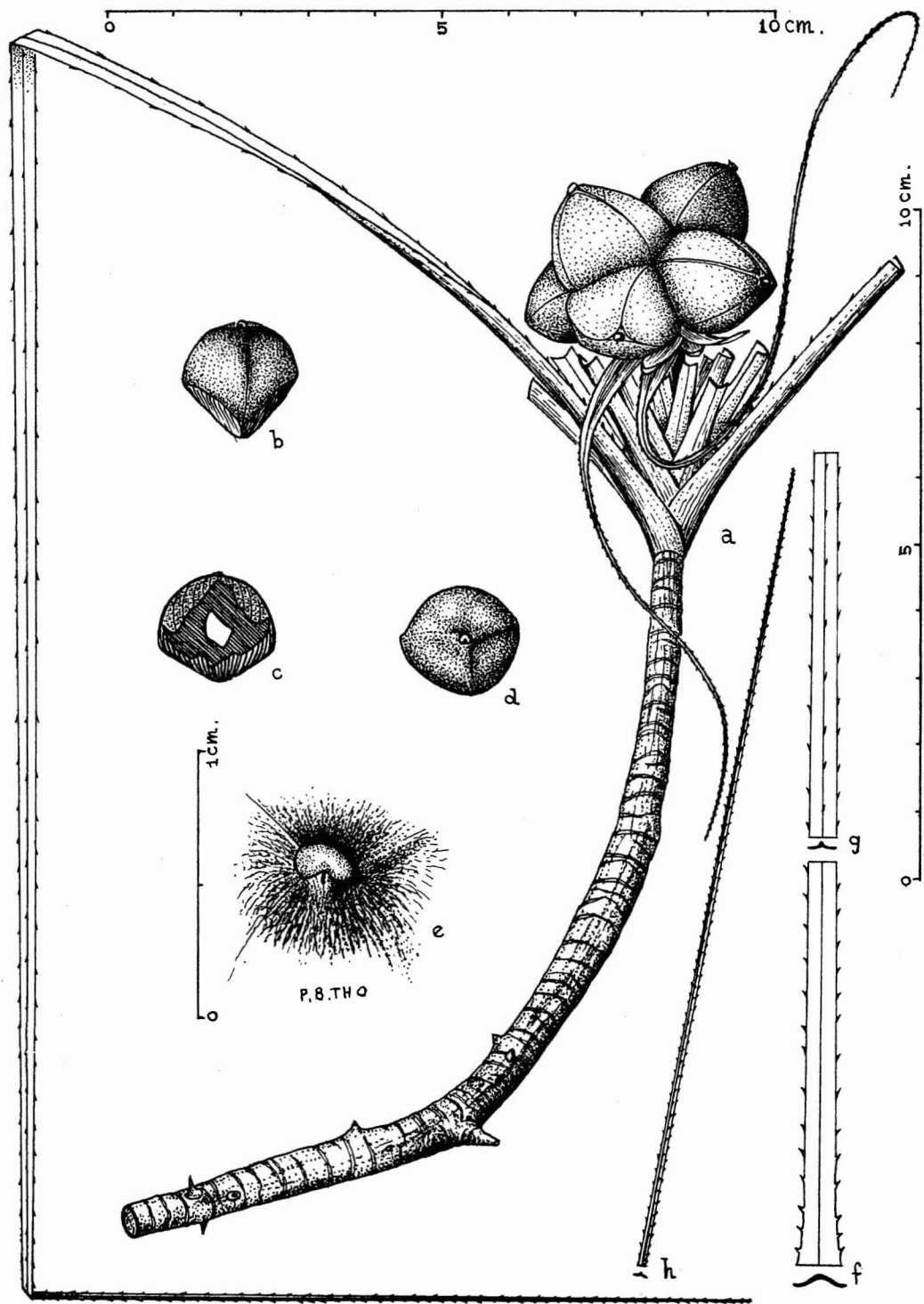


FIG. 265. *Pandanus subglobosus* St. John, from holotype. *a*, Fruiting branch,  $\times 1$ ; *b*, drupe, lateral view,  $\times 1$ ; *c*, drupe, longitudinal median section,  $\times 1$ ; *d*, drupe, apical view,  $\times 1$ ; *e*, stigma, apical view,  $\times 4$ ; *f*, leaf base, lower side,  $\times 1$ ; *g*, leaf middle, lower side,  $\times 1$ ; *h*, leaf apex, lower side,  $\times 1$ .



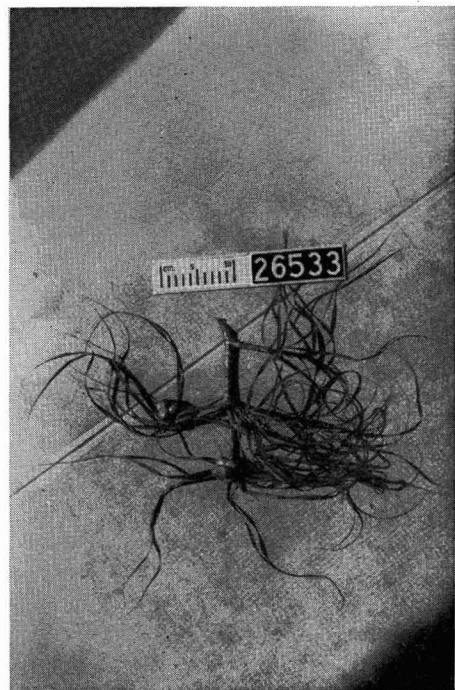
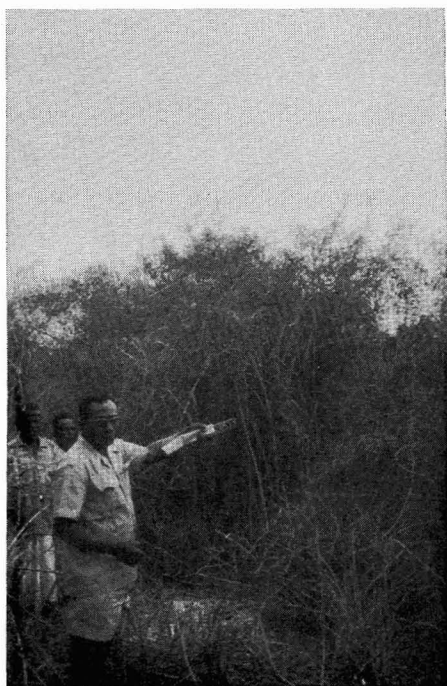


FIG. 266. *Pandanus subglobosus* St. John, holotype. *Top left*, leaning shrub and prop roots, and photo of M. Rabonary Rajaona, ingénieur, Service des Eaux et Forêts; *top right*, prop roots; *bottom left*, trunk and fruiting branchlets; *bottom right*, fruiting branchlets.

et midnervo infra cum aculeis 0.6–1 mm longis 2.5–4 mm separatis arcuato-subulatis adscendentibus, in apice subulato marginibus et midnervo infra cum subulato-serrulis 0.3–0.6 mm longis 1.5–3 mm separatis, infructescentia terminali cum syncarpio unico, pedunculo 2–2.5 cm longo 3–4 mm diametro recto adscendenti cum bracteis terminalibus pluribus binis exterioribus cum basi 10–12 mm longis 4–10 mm latis distenti lanceolata naviculari lutea cum apice foliaceo 3–12 cm longo 2–2.5 mm lato in basi et subulato, syncarpio 3.5–4 cm diametro globoso cum (5)–6–(7) drupis viridibus eis 16–21 mm longis 16–20 mm diametro subglobosis viridibus 1-carpellatis 3–5 angulosis parte infera cuneata cum lateribus planis parte  $\frac{1}{2}$  supera et plus libera laevi lucida; stigmata apicali horizontali 2–2.5 mm diametro orbiculari-cordato elevato pallide brunneo papilloso, endocarpio supramediali 13–14 mm longo osseoso pallide brunneo late ovoideo cum humere mediali laterali lateribus lateralibus 5–6 mm crassis intra pallide castaneo-brunneo laevi lucido, semine 5 mm longo 3 mm diametro obliquiter ellipsoideo, mesocarpio apicali medullosa humido, mesocarpio basali carnosum et fibroso.

**DIAGNOSIS OF HOLOTYPE:** Shrub, its main stem 5–7 m long, 3–4 cm in diameter, its vertical base usually decaying and vanishing, the middle section more or less horizontal, supported by numerous horizontal or ascending prop roots 2–3 m long, 2 cm in diameter, green to gray, muricate; leaves 28–42 cm long, 4–7 mm wide, above green, below pale green with dark-green veins, at midsection with 8–9 parallel secondary veins in each half, tertiary veins none, over the midrib with a broad, shallow furrow, then the sides gently down-curved but not pleated, blade ligulate but the outer  $\frac{1}{3}$  gradually long tapering into a 10–15 cm flattened, subulate apex, this 10 cm down 2–3 mm wide, base amplexicaul, unarmed, dark shiny green even where covered, prickles all white, translucent, at base beginning at 6–10 cm up the margins with prickles, the lowest ones 0.8–1.2 mm long, 1.5–3 mm apart, oblique deltoid, slightly ascending, then the next series 1.3–2 mm long, 2–6 mm apart, arcuate subulate from a deltoid base, ascending; beginning at 4–5 cm up the midrib below with prickles 0.5–0.6 mm long, 2–5 mm apart, arcuate subulate, ascending; at midsection the margins and midrib below with prickles 0.6–1 mm long, 2.5–4 mm apart, arcuate subulate, ascending; on the subulate apex the margins and midrib below with subulate-serrulations 0.3–0.6 mm long, 1.5–3 mm apart; infructescence terminal,

bearing one syncarp; peduncle 2–2.5 cm long, 3–4 mm in diameter, straight, ascending, with several apical bracts closely subtending the syncarp, the two outer ones with the base 10–12 mm long, 4–10 mm wide, expanded, yellowish, lanceolate, navicular, bearing a foliaceous tip 3–12 cm long, 2–2.5 mm wide at base, subulate; syncarp 3.5–4 cm in diameter, globose, bearing (5)–6–(7) drupes, green (perhaps always so); drupes 16–21 mm long, 16–20 mm in diameter, 1-celled, subglobose, green, 3–5-angled, the lower section cuneate with flattened sides, slightly more than upper  $\frac{1}{2}$  free, smooth, shining; stigma apical, horizontal, 2–2.5 mm in diameter, orbicular-cordate, elevated, pale brown, papillose; endocarp supramedian, 13–14 mm long, bony, pale brown, broad ovoid, with median lateral flange, lateral walls 5–6 mm thick, within light chestnut-brown, smooth, shining; seed 5 mm long, 3 mm in diameter, oblique ellipsoid; apical mesocarp of moist pith; basal mesocarp fleshy and fibrous.

**JUVENILE PLANT** (*St. John* 26,534): Stem 60 cm tall, 1.5 cm in diameter; leaves 45–55 cm long, 8–10 mm wide, at midsection with 10–11 secondary parallel veins in each half; near the base the principal marginal spines 4–4.5 mm long, 9–24 mm apart; midrib below unarmed to beyond the middle.

**HOLOTYPE:** Malagasy Republika, Amani-nomby, 20 km N.E. of Majunga, 2 km inland, low scrub forest of *Terminalia* sp. and *Sideroxylon* sp., on dry sand plain, 10 m alt, Aug. 8, 1961, *H. St. John* 26,533 (BISH).

**DISCUSSION:** *P. subglobosus* is a member of the section *Microstigma*, as is its closest relative, *P. oligocarpus* Martelli, of the nearby plateau d'Antanimena, a species with the syncarp bearing 9 drupes; drupes 13–15 mm long, ovoid, the upper  $\frac{2}{3}$  free; endocarp in longitudinal section irregularly ovate; and the leaves 40–70 cm long. *P. subglobosus* has the syncarp with usually 6 drupes; drupes 16–21 mm long, subglobose, upper  $\frac{1}{2}$  free; endocarp in longitudinal section irregularly cruciform; and the leaves 28–42 cm long.

The new epithet is the Latin adjective, *subglobosus*, almost spherical, and is given in allusion to the shape of the drupes.